CURRENT PRACTICES AND ANTICIPATED CHANGES IN QUANTITATIVE AND QUALITATIVE ADMISSION INFORMATION SOURCES FOR ENTRY-LEVEL PHARMD PROGRAMS

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An Abstract of a Dissertation by
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The Problem: This study's purpose was to describe and compare current and anticipated pharmacy admission procedures including documentation of studies that relate admissions criteria with achievement in pharmacy education and practice.

Procedures: An author-constructed survey collected data from pharmacy programs on current and anticipated admission processes, as well as the presence of assessment self-studies. A 92% response rate was achieved.

Findings: A lack of significant changes was demonstrated between admission practices used for the Fall 1997 entering class and those anticipated for Fall 2000. Likewise, qualities sought and information sources used to measure these qualities are not expected to change significantly. Changes can be expected in the area of assessment/validation practices.

Conclusions:

- Current practices are not expected to change.
- Qualitative and quantitative admission information sources are utilized.
- Affective qualities and information sources listed in the health care literature are those used in pharmacy program admissions.
- Many programs do not undertake local studies and are unsure of their assessment procedures in the future.
- Most pharmacy programs (82%) feel they are meeting the adopted American Council on Pharmacy Education (ACPE) Guidelines 16.3 and 16.5.

Recommendations:

- Complete studies after the admission process for the fall 2000 to verify these respondents' perceptions. In addition, complete studies on Bachelor of Science program admission practice changes when programs transition to an entry-level PharmD.
- Publish studies on admission sources that predict success as a student and a practitioner.
- A lack of significant changes does not signal concern but indicates that programs consider non-academic qualities.
- ACPE's standards appear to be realistic and applicable to pharmacy programs. Most representatives feel their programs are achieving ACPE. However, each program's practices and procedures should be further examined.

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Chapter 1

INTRODUCTION

Background

Pharmacy education admission practices are changing as indicated by the increasing number requiring applicant interviews (American Association of Colleges of Pharmacy, 1996; 1997). In a survey of member institutions, the American Association of Colleges of Pharmacy (AACP, 1997) reported that 68% of the pharmacy programs will require interviews for individuals applying for admission to Doctor of Pharmacy (PharmD) programs during the 1998-99 academic year. In comparison, 43% of the schools required interviews for the 1990-91 academic year (AACP, 1989). The increase in the number of pharmacy programs requiring an interview for admission is likely the result of non-academic qualities becoming more important in admission decisions. Factors influencing this change are the importance of the admission process (Duncan-Hewitt, 1996), the pharmaceutical care philosophy of practice (Duncan-Hewitt), continued competition for admission spaces into pharmacy schools (AACP, 1989;1996), and an ongoing interest in admitting students who will graduate and become successful practitioners (Wu-Pong, Windridge, & Osborne, 1997).

Importance of the Admission Process

A high correlation exists between admission into a professional school and entrance into a health care profession (McGaghie, 1990). Therefore, Stumpf and Liskin (1994) note that admitting students to a program is nearly analogous to granting them a license.

Duncan-Hewitt (1996) noted that an admission process should admit students with qualities and skills such as communication, motivation, ethics, and leadership because of the limits within the curriculum to develop these qualities. These limits are due to the increasing knowledge base specific to pharmacy. Therefore, the more qualities and skills students possess upon entrance into pharmacy school, the more they will be able to concentrate on the development of an adequate knowledge base.

Admission practices are also important because of economic considerations. An admission process needs to be developed that is an effective and efficient use of faculty time and the institution's financial resources (Friedman et al., 1987).

Pharmaceutical Care

Hepler and Strand (1989) introduced pharmaceutical care as a philosophy of practice which requires pharmacists to possess several qualities and skills such as communication, problem-solving, lifelong learning, motivation, and a willingness to be responsible for patient care (Penna, 1994). These qualities and skills are in addition to the knowledge base which has been the primary educational focus of pharmacy programs. Pharmaceutical care as a standard of practice has been endorsed by professional pharmacy organizations and commissions (AACP, 1997; American Council on Pharmaceutical Education, 1997; American Pharmaceutical Association, 1992; Commission to Implement Change, 1991) and a large segment of the practicing professionals (AACP, 1997).

Similar to the medical profession (Mitchell, 1987), pharmacy requires certain abilities and ethical values that are critical attributes for members of a caring profession. The attainment of these abilities and ethical values is the

outcome of both the selection of undergraduate medical students with potential for effective service and the subsequent participation of students in high-quality programs of education. Thus, the selection of promising candidates is an important endeavor for the future success of health care professions (Mitchell).

The pharmaceutical care philosophy and model for practice has also had an impact on pharmacy education. These effects include the development of entry-level Doctor of Pharmacy (PharmD) programs; problem-based, student-centered learning environments (Commission to Implement Change, 1991; Duncan-Hewitt, 1996); and the adoption of new pharmacy educational accreditation standards (American Council on Pharmaceutical Education, 1997).

Entry-level PharmD programs

Many pharmacy schools offer entry-level PharmD programs. Of the 78 pharmacy schools, 22 currently offer the Bachelor of Science degree, 39 offer the entry-level PharmD and 17 offer both degrees (AACP, 1997). AACP data report the number of schools offering entry-level PharmD degrees for fall 1997 was 64. The shift to this advanced degree allows programs additional time to develop the knowledge and skills necessary to practice pharmaceutical care.

Problem-based, Student-centered Learning Environments

In preparing graduates for pharmaceutical care practice, pharmacy schools attempt to develop skills through the use of active problem-based learning environments. To this end, schools are shifting from a passive, lecture-based teaching style to an active, participatory environment (Duncan-Hewitt, 1996). The Commission to Implement Change in Pharmacy Education

(1991) recommends active learning environments which provide students the challenge to take responsibility to learn just as they will be expected to do in practice.

New College Accreditation Standards

Pharmaceutical care has also influenced the adoption of new standards by the American Council on Pharmaceutical Education (ACPE, 1997) which will be implemented with the entering class for Fall 2000. These standards require that college admission procedures include non-academic qualities in addition to academic factors. Guideline 16.3 (ACPE, 1997) of the newly adopted standards states:

> Admissions criteria, policies, and procedures should give consideration not only to scholastic accomplishments, but also to other factors such as motivation, industry, and communication capabilities that show the student's potential to become a life-long learner and an effective professional (p. 25).

Competition for Spaces

Another factor encouraging change in admission standards is the continuing competition for available student spaces in pharmacy programs (American Association of Colleges of Pharmacy, 1989; 1996). Colleges typically have more qualified applicants than available seats. This competition results in admission practices that select individuals with the highest likelihood of success. In response, colleges are implementing standards and criteria that will select applicants who will be the most successful in the new professional and educational environments.

Selection of Students Who Will Be Successful

Because of the professional, educational, and competitive factors, pharmacy programs are interested in and able to selectively admit individuals who will be successful students and practitioners (Wu-Pong et al., 1997). Several medical schools have found positive and negative correlations between admission information source scores and didactic course work, clinical rotation assessments, board exam scores, or successful completion of the program (Mitchell, 1990).

ACPE's college accreditation guidelines encourage the study of program admission practices that predict success in the program and as practitioners. ACPE (1997) Guideline 16.5 states "Studies are encouraged that relate admissions criteria with student achievement in the professional program in pharmacy and performance in professional practice" (p. 25). Mitchell (1987) determined that 47% of medical schools validate their admission processes with at least one of the following criterion variables: professional grade point average, clinical grade point average, licensure board scores, or successful completion of the program. The literature review indicated that a similar question of this nature has not been asked of pharmacy programs and their admission process validation/assessment activities.

Statement of the Problem

In response to the professional and competitive factors, many pharmacy programs are including criteria in the admissions process that will measure academic and non-academic qualities. The Pharmacy School Admission Requirements (AACP, 1996) documents limited information on admission requirements for each college of pharmacy in the United States.

This publication includes admission requirements for grade point average, pharmacy college admission test (PCAT), and interview. However, it does not mention the criteria used to assess nonacademic characteristics in the selection process (Cocolas, Sleath, & Hanson-Divers, 1997). In addition, Cunny and Perri (1990) note that information is lacking on the way admission sources are used by pharmacy programs. For example, procedures utilized to gather admission information data, measure non-academic qualities, or complete local validation studies that predict success as a student or practitioner are not included in this publication. Furthermore, the new PharmD accreditation standards that will be implemented with the Fall 2000 entering class may have an impact on the admission activities. Therefore this study, co-sponsored by the American Association of Colleges of Pharmacy (AACP), and the American Council on Pharmaceutical Education (ACPE), attempted to provide additional knowledge and advance the understanding of the current and future admission practices.

Purpose of the Study

Pharmacy education is in transition due to changes in the profession, degrees offered, revised teaching styles, and accreditation standards. Consequently, admission practices may be continuing to change. The purpose of this study was to describe and analyze the current and anticipated changes in admission practices among schools of pharmacy in the United States. This included documentation of the presence of institutional studies that relate admission criteria with student achievement in school or the profession.

Research Questions

The following is a summary of the research questions that guided this study. Further descriptions of these research questions are contained in chapter 3.

1. Does the current use of qualitative and quantitative information sources by colleges of pharmacy in their admission practices differ from expected practices in the future?

2. Is there a significant difference between the non-academic qualities that pharmacy schools currently assess in applicants and those they expect to assess in the future?

3. Will pharmacy programs' future use of information sources to assess non-academic qualities differ from current use?

4. Is there a difference between the current and future assessment/validation of admission processes by pharmacy schools?

All of the research questions refer to current and future practices. For the purposes of this study, current was defined as the practices which were used to admit Fall 1997 applicants and future was defined as those practices which are expected to be used for the Fall 2000 admitted class. The Fall 2000 class was chosen as the future point for two reasons. First, the new accreditation standards recently passed by ACPE will go into effect with students who enter professional entry-level PharmD programs for the academic year 2000. Therefore, it is possible that admission practices will change between those used in the 1997-98 academic year and those anticipated for the 2000-01 academic year. Second, some schools may have determined changes but not yet implemented them.

A survey constructed by the author was administered to the admission committee chairs at all 78 colleges of pharmacy in the United States. Those institutions that offered entry-level PharmD programs for the Fall 1997 entering class were asked to complete the survey. The research questions formed the basis for this survey which was pilot-tested for content validity with experts in the field as well as a sample of five admission committee chairs. Mitchell's survey (1987) formed the basis for the format and content of the questions. Statistical analyses completed on the data included paired t-tests, factor analysis, correlation, and Chi-square procedures.

Significance of the Study

The pharmacy profession and educational environments, in addition to competition for spaces in pharmacy programs, affect pharmacy admission criteria. Since the profession and pharmacy education environment is shifting to a greater reliance on patient care qualities, qualitative information sources may be increasing in importance. By answering the research questions in this study, members of the pharmacy profession will be able to assess whether changes in admission practices are continuing and if so, their congruence with those occurring in the profession. If this study indicates that changes are not expected, it could mean (a) pharmacy schools are already meeting the expectations based on the standards, or (b) pharmacy programs are not meeting the standards. Specific practices that will be assessed for future change include the importance of the information sources, qualities sought and information sources used to assess those qualities, and the completion of institutional studies to assess the admission practices.

Assumptions

The assumptions underlying this study were:

1. Pharmaceutical care is the philosophy of practice adopted by pharmacy education.

2. Schools have determined changes for the process to admit students for the academic year 2000-01.

3. Respondents were consistent in determining the importance of the information sources and characteristics.

Delimitations of the Study

This study did not address several issues related to admission practices. These included: a preferred admission model, recommendations on how schools should validate their admission data, and specific studies correlating admission scores with criterion variables. The Carnegie Council (1977) suggests that professional schools should be given the freedom to determine admission processes which will meet the needs of the local and national societies. Since the diversity of colleges is an important asset of the higher education system, one admission model is not recommended.

Many studies have been published about health care admission practices suggesting information sources which have predictive value for particular points in the curriculum and in practice. However, due to the many possibilities and program resources, it is more valuable to provide guidelines rather than to recommend a method to undertake a local study. Since this study focused on changes within pharmacy school admission requirements, specific institutional data was not collected to determine the

individual school effectiveness of the admission practices, only the presence or absence of the occurrence of such research.

Limitations of the Study

Following are a list of limitations that existed and efforts undertaken to control them:

1. Some schools may have already made changes in admission practices. Therefore, this study may not detect changes if they occurred prior to 1997. If schools feel that they are already meeting the standards they will not be planning changes. Therefore, a question was asked on the survey if schools were already in accordance with the standards that will go into effect for the entering class of 2000.

2. A transition period may be occurring for many pharmacy schools which may make it difficult for current practices to accurately reflect the admission procedures. Therefore, current data was collected along with the future presumed practices. The year 2000 was used in the survey with the intention that it would be far enough into the future to detect trends but yet a short enough future time period for admission procedures to be accurately predicted.

3. Admission committee chairs may answer with their perceptions of future practices rather than what will actually occur at their institution. This limitation was addressed by realizing that the current information source importance ratings were also the individual respondents' perceptions. Therefore, consistency was likely to occur among the current and future responses.

4. Due to the survey sponsorship, admission committee chairs may have completed the questions with a preferred response rather than actual practices. This limitation was attempted to be controlled by providing coded surveys for follow-up only. In addition, respondents were assured in the cover letter that data would only be reported in the aggregate.

5. This study's survey was a lengthy instrument so the possibility of fatigue, bias, and other threats to validity were possible. To guard against this, the questions were framed in yes/no, Likert scale, and check-off format. The pilot group reported that the survey took approximately 30 minutes to complete. This time frame was deemed acceptable for a survey of this nature.

6. Since this survey was author-constructed, issues of validity were present. Therefore, a pilot group was used to enhance the content validity. In addition, construct validity was evaluated using the survey responses and the question asking respondents if their institution was meeting the new accreditation standards.

7. Statistical limitations were present because of the low sample size and possibility of Type I errors. Thus, ANOVA tests could not be used with all of the demographic variables. To control the Type I error possibility, adjustments were made in the alpha level when multiple statistical tests were used.

Conclusion

Along with the profession, pharmacy school admission practices are changing. The goal of this study was to describe and compare current and anticipated pharmacy admission procedures and document the presence of studies that relate admissions criteria with student and professional practice

achievement. The literature review described the changes in the profession and provided documentation of information resources and predictability studies. The survey provided data on the current and anticipated pharmacy school admission processes, as well as local studies assessing the admission process. Through the provision of this information, pharmacy leaders may assess the concurrence of admission practices with the expectations of professional practice.

Definitions of Terms

Throughout this study, the following terms will have the following definitions:

Pharmaceutical care -Hepler and Strand have defined pharmaceutical care as:

> the responsible provision of drug therapy for the purpose of achieving definite outcomes that improve a patient's quality of life. These outcomes are (i) cure of a disease; (ii) elimination of reduction of a patient's symptomatology; (iii) arresting or slowing of a disease process; or (iv) preventing a disease or symptomatology.
>
> Pharmaceutical care involves the process through which a pharmacist cooperates with a patient and other professionals in designing, implementing and monitoring a therapeutic plan that will produce specific therapeutic outcomes for the patient. This in turn involves three major functions: (i) identifying potential and actual drug-related problems; (ii) resolving actual drug-related problems: and (iii) preventing potential drug related problems.

> Pharmaceutical care is a necessary element of health care, and should be integrated with other elements. Pharmaceutical care is, however, provided for the direct benefit of the patient, and the pharmacist is responsible directly to the patient for the quality of that care. The fundamental relationship in pharmaceutical care is a mutually beneficial exchange in which the patient grants authority to the provider, and the provider gives competence and commitment (accepts responsibility) to the patient. The fundamental goals, processes, and relationships of pharmaceutical care exist regardless of practice setting (p. 12S).

Affective qualities: Those qualities other than grade point average and standardized tests, including but not limited to communication, motivation, life long learning, care for a patient, and other skills and characteristics inherent in pharmaceutical care (ACPE, 1997). A complete list of these qualities as stated in the literature is compiled in Appendix A.

Quantitative information sources: Those sources that are reported to pharmacy schools in quantitative form and usually refer to cognitive measurements. Quantitative information sources include (a) grade point average (Charupatanapong, McCormick, & Rascati, 1994; McGaghie, 1990; Spooner, 1990), (b) standardized exams (Anderson, 1990; McGaghie, 1990; Mitchell, 1987), and (c) foreign language exams (Wu-Pong et al., 1996).

Qualitative information sources: McGaghie (1990) defines qualitative variables as features of an individual's character, personality, or personal and social history that contribute to success as a health professional. Those sources that refer to affective qualities and are reported to pharmacy schools in a qualitative form. Qualitative information sources consisted of (a) interview (McGaghie, 1990; Mitchell, 1987; Spooner, 1990), (b) essay (Duncan-Hewitt,

1996); (c) recommendations (Baker, Bailey, Brahen, Conroy, Dorman, Haynes, 1993), (d) personality profiles (McGaghie, 1990), (e) other assessments (Cocolas, Sleath, & Hanson-Divers, 1997; Duncan-Hewitt, 1996; Schmalz, Rahr, & Allen, 1990; Taylor, 1990), (f) extra-curricular activities (Duncan-Hewitt, 1996), and (g) previous degree (Chisholm, Cobb, Kotzan, & Lautenschlager, 1997).

Problem-based, student-centered learning environments: In this type of environment teachers act as coaches and facilitators rather than providers and interpreters of information. The focus in this learning style is on the process of solving problems, fundamental information through a variety of education strategies, communication skills, and practice skills through experiential education (Commission to Implement Change in Pharmaceutical Education, 1991).

Entry-level PharmD degree: This is the professional doctorate of pharmacy degree which is obtained without receiving a Bachelor Degree first (Conlan, 1997). AACP (1997) explains

> All pharmacy colleges operate under one of three plans: 1) One year of pre-professional education preceding admission to the professional curriculum; 2) two years of pre-professional education followed by professional studies; or 3) an integrated curriculum with all years of study in the professional college.
>
> This degree requires at least four years of professional study following a minimum of two years of pre-professional study for a total of six academic years following high school. (p. ix).

Chapter 2

REVIEW OF THE LITERATURE

Overview of Chapter

This chapter will review the importance of the admission process, changes in the pharmacy profession and educational environments, the need for evaluation of qualitative characteristics in addition to academic criteria, sources used to provide applicant information and data, and predictability studies linking admission scores to success as a student or professional.

This review will benefit from literature published by other health care professions that are selective admission processes and place an emphasis on clinical experiences. These include: dentistry (Walker, Killip, & Fuller, 1985), medicine (McGaghie, 1990), physical therapy (Levine, Knecht, & Eisen, 1986), and occupational therapy (Blaisdell & Gordon, 1979; Schmalz, Rahr, & Allen, 1990). The references used in this review of literature were judged to be within the scope of this topic, and valid in terms of methodology, results, and conclusions. Those references evaluated but which did not meet these criteria were excluded.

Importance of the Admission Process

The admission process is an important aspect of the educational process and the future of the profession. Stumpf and Liskin (1994) opine that the entire health care field is affected by the selection and education of professionals. Reasons for this importance include the high likelihood that admitted students will enter the profession, the limitation of time in the curriculum for development of all of the skills and characteristics to make a

successful practitioner, and the presence of economic pressures on programs. Each of these forces will be discussed in further detail in the following sections.

Entrance into the Profession

The Carnegie Council on Policy Studies in Higher Education (1977) reports that many professions play a 'gate-keeper' role by utilizing selective admission processes which control or strongly influence entrance into a profession. McGaghie (1990) agrees, observing that a significant majority of the health care student population achieves the necessary requirements to graduate. The 'gate' is opened widest or closed quickest at the selection stage (Stumpf & Liskin, 1994). Furthermore, most graduates receive licenses from state boards since these agencies are more lenient in judging social and ethical transgressions in their applicants than are health professional schools (Spooner, 1990). Therefore, admitting students to a health professional school is tantamount in a decision to grant them a license.

The Carnegie Council (1977) suggests that professional schools are distinctive in that they must be: (a) careful to admit students who have the ability to practice the profession with competency and integrity, (b) conscious of the public needs and supply graduates who will meet those needs, and (c) provide graduates who are able to pass uniform licensure exams.

Time Limitations in the Curriculum

A second factor underscoring the importance of the admission process is the limited time during the pharmacy course work to develop all of the necessary knowledge and skills needed to enter the profession. Duncan-Hewitt (1996) notes this limit of time during the pharmacy curriculum,

particularly as drug therapies become more complex and precise in pharmacy curricula (Lowenthal, 1988). An admission process is recommended that will admit students who have the appropriate prerequisite knowledge, skills, and values that can be further developed during the program rather than trying to instill them in the educational process (Duncan-Hewitt, 1996; Powis, Neame, Bristow, & Murphy, 1988). The more skills and qualities students possess at matriculation, the more they will be able to concentrate on developing appropriate knowledge base during their pharmacy curricula. It is important that those involved in the admission process design and implement policies and practices which insure that applicants with the highest likelihood of success are selected for entrance into the health care professions (Blaisdell & Gordon, 1979; Stumpf & Liskin, 1994; Wu-Pong et al., 1997).

Economic Pressures

Pharmacy education continues to refine the admission process and make it as effective and efficient as possible (Friedman et al., 1987). Hansen and Pozehl (1995) note the economic implications of admission policies. These authors suggest than an attempt be made to balance the efficient use of faculty and other academic resources with the selection and preparation of future professionals. In times of budgetary constraints and demands for financial efficiency, these economic implications become even more important.

Friedman, Lage, Norwood, and Stewart (1987) and Chisholm, Cobb, and Kotzan (1995) observe that in addition to selecting potentially successful practitioners, health profession schools are faced with increased competition, the need to assure appropriate representation of minority students, the desire

to minimize student attrition, the increased use of standardized tests, and the development of traditional and nontraditional quality programs.

Changes in Pharmacy Practice and Education

Changes in the pharmacy practice environment, educational standards, and teaching methods have each provided an impetus for change in admission practices. Another factor, competition for spaces in the program, has also had an impact on selection criteria.

Changes in Professional Practice

The practice of pharmacy has shifted to a patient-oriented care environment (AACP, 1997). Hepler and Strand (1989) introduced this philosophy of practice which is defined as:

> the responsible provision of drug therapy for the purpose of achieving definite outcomes that improve a patient's quality of life. These outcomes are (i) cure of a disease; (ii) elimination or reduction of a patients symptomatology; (iii) arresting or slowing of a disease process; or (iv) preventing a disease or symptomatology.
>
> Pharmaceutical care involves the process through which a pharmacist cooperates with a patient and other professionals in designing, implementing and monitoring a therapeutic plan that will produce specific therapeutic outcomes for the patient. This in turn involves three major functions: (I) identifying potential and actual drug-related problems; (ii) resolving actual drug-related problems: and (iii) preventing potential drug related problems.
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> Pharmaceutical care is a necessary element of health care, and should be integrated with other elements of practice. Pharmaceutical

> care is, however, provided for the direct benefit of the patient, and the pharmacist is responsible directly to the patient for the quality of that care. The fundamental relationship in pharmaceutical care is a mutually beneficial exchange in which the patient grants authority to the provider, and the provider gives competence and commitment (accepts responsibility) to the patient.
>
> The fundamental goals, processes, and relationships of pharmaceutical care exist regardless of practice setting (p. 12S).

Thus, instead of only dispensing what the physician prescribes, the future of pharmacy as a health care profession lies in its ability to contribute to the rational use of medication in health care. The Janus Commission (AACP, 1997) reports that this philosophy of practice has been accepted as pharmacy's role in health care by most national pharmacy professional associations and a large segment of the health care population. Duncan-Hewitt (1996) suggests that institutions may wish to redesign curricula as well as selection criteria so graduates will be better prepared to meet the challenges of pharmaceutical care.

Changes in Educational Standards

In addition to the effects on practice, pharmaceutical care has also affected pharmacy education. The Commission to Implement Change in Pharmaceutical Education (1991) states that the mission of pharmacy practice is to render pharmaceutical care. Pharmacy education has a corresponding responsibility to the public to prepare students who are competent to practice pharmaceutical care and to promote the philosophy within the profession (Commission to Implement Change in Pharmaceutical Education, 1991).

The national agency for accreditation of professional degree programs in pharmacy, the American Council on Pharmaceutical Education (ACPE), has introduced new standards for pharmacy education which give consideration to pharmaceutical care. These standards were adopted in June of 1997 and will be fully implemented with the entering pharmacy classes of Fall 2000. Admission criteria, policies, and procedures are discussed in Standard No. 16 (ACPE, 1997). Those guidelines regarding the admission process which are pertinent to this study include 16.3, and 16.5:

> Guideline 16.3. Admissions criteria , policies, and procedures should give consideration not only to scholastic accomplishments, but also to other factors such as motivation, industry, and communication capabilities that show the student's potential to become a life-long learner and an effective professional.
>
> Guideline 16.5. Studies are encouraged that relate admissions criteria with student achievement in the professional program in pharmacy and performance in professional practice (p. 25).

These new accreditation guidelines require other information sources to be used besides grade point average and other academic sources. Furthermore, implementation of longitudinal research on the predictability of the admission criteria for future success is also encouraged.

Changes in Teaching Methods

The transition in teaching styles from a passive learning setting to an active learning environment is also promoting change within pharmacy program admission practices. Because most students enter health professional schools dependent on the teacher for learning, it becomes the responsibility of pharmacy educators to shift the burden of learning from the teacher to the

student. The Commission to Implement Change in Pharmaceutical Education (1991) notes the importance of teaching and learning style consideration in addition to course content. This commission proposed that students achieve outcomes necessary for the provision of pharmaceutical care through the way they are taught as well as the content of the curriculum. Therefore, an active learning environment is suggested that allows teachers to act as coaches and facilitators rather than providers and interpreters of information. This occurs through focusing on the process of solving problems, providing fundamental information through a variety of education strategies, developing communication skills, and practicing skills through experiential education (Commission to Implement Change in Pharmaceutical Education, 1991).

As a result of major curriculum revisions in content and teaching style schools are reviewing and changing their criteria for admission (Duncan-Hewitt, 1996). These programs attempt to admit students who will have success in a learning environment which requires students to take responsibility for their learning.

Competitiveness for Positions in Health Professional Schools

Another reason that admission practices at pharmacy schools are changing is the continuing competition for spaces in each class. Blaisdell and Gordon (1979) note that although many health profession applicants are not qualified academically or personally, a significant number do meet the criteria to be admitted. Unfortunately, health professional educational programs cannot accommodate all of the qualified applicants because of the nature of the curricula and restricted space in the programs. The Carnegie Council (1977) notes that the cut-off point in many professional schools, including the

health professions (Cocolas et al., 1997; McGaghie, 1990) exceeds a reasonable minimum level in an effort to eliminate substantial numbers of applicants. Thus, the pool of applicants is usually larger than the pool receiving consideration by many programs.

Pharmacy is not an exception to this phenomenon. Table 1 lists the average applicant to enrolled student ratio for pharmacy programs in the United States over the past several years. Over the past several years, national data document that 2.7 to 4.1 applications have been received for every enrolling student (AACP, 1990-1997). Cocolas et al. (1997) note that competition for admission has increased the quality of acceptable candidates so that more qualified individuals apply than spaces available in entering pharmacy classes.

Table 1

Applicant to Enrolling Student Ratios for Years 1989-1996

Year	Applicant/Enrolling Student Ratio
1989-90	2.7:1
1990-91	3.0:1
1991-92	3.3:1
1992-93	3.9:1
1993-94	4.0:1
1994-95	4.1:1
1995-96	3.6:1

With an overabundance of candidates for positions in pharmacy schools, it is the school's responsibility to admit those students who have the

highest likelihood of success. Hansen and Pozehl (1995) note that it is important for schools to develop admission criteria that predict not only program completion, but also high achievement in academics and in performance as a professional.

The Admission Process

Because of the importance of the admission process and the professional, educational, and competitive factors, it is important for the admission practices to encompass the roles and importance of quantitative and qualitative variables and information sources. The topic of finding ways of evaluating these qualities is of interest not only to admission committees, but applicants and society as well. Hall and Bailey (1992) note that applicants are also interested in an admissions process that provides fair and equitable consideration. The Carnegie Council (1977) notes that programs and applicants are not the only parties interested in professional program admission practices. Since these procedures affect services available to the entire population, the society at large also has an interest in who is admitted to health care professional programs.

McGaghie (1990) suggests that schools follow a process in organizing, aggregating, and summarizing qualitative data: (a) clarify which qualitative and quantitative variables will be considered; (b) decide which information sources will be used and the mechanism for collecting the data; (c) if desired, aggregate the data into composite indexes, or profile of fitness records; and (d) understand that precise and useful data can be obtained from measurements on categorical and ranked scales. Each of these steps will be discussed in further detail in the following sections.

Quantitative and Qualitative Variable Roles

The Carnegie Council (1977) explains that traditional qualitative measures such as grade point average and test scores are useful to determine the applicants who are likely to be successful academically. Conversely, this data may indicate those who will be unsuccessful which results in high costs to the student and the institution. However, this council notes that sole reliance on these information sources alone is usually insufficient.

McGaghie (1990) notes that in the competitive medical student pool, admits are primarily selected by quantitative variables, such as grade point average or standardized test scores, even though the ideal of the profession includes qualitative aspects as well. This author defines qualitative variables as features of an individual's character, personality, or personal and social history that contribute to success as a health professional. Duncan-Hewitt (1996) suggests that in addition to an adequate background of knowledge and skills, including mathematical proficiency, applicants should be assessed for their communication skills (written, verbal, and nonverbal), information processing skills (including computer literacy), general thinking skills of critical thinking and reasoning, and the specific thinking skills of problem-solving and decision making, interpersonal and group skills, disposition to self-learn, and affective qualities.

Since the qualitative variables are a key part of professional competence and most conspicuous when they are absent, widespread recognition exists that they should be evaluated at the point of admission (McGaghie, 1990). Mitchell (1987) agrees, observing that abilities and ethical values are critical attributes for members of a caring profession. Mitchell suggests the attainment of abilities and values is the product of both the

selection of students with potential for effective service and the subsequent participation of students in high-quality programs of education. Therefore, Mitchell (1990) recommends that demographic and other nonacademic data should supplement academic information in the selection of students.

An important aspect of admissions for a program is the unique characteristics which allow for the maintenance of diversity among graduates entering the health care professions (Carnegie Council, 1977). However, practical and reliable methods that include affective qualities are not widely used (McGaghie, 1990).

Appendix A lists the specific affective qualities from the literature sources that discuss characteristics at the point of admission. Those variables listed in more than one literature source include:

- Motivation to enter the profession (ACPE, 1997; Baker et al., 1993; Blaisdell & Gordon, 1979; Duncan-Hewitt, 1996; Hall & Bailey, 1992; Meredith, Dunlap, & Baker, 1982; Powis et al., 1988),
- Oral and/or written communication skills (ACPE, 1997; Duncan-Hewitt, 1996; Hall & Bailey, 1992; Hansen & Pozehl, 1995; Levine, Knecht, & Eisen, 1986),
- Interpersonal relations (Hall & Bailey, 1992; McGaghie, 1990; Meredith et al., 1982)
- Leadership (Hall & Bailey, 1992; McGaghie, 1990)
- Maturity (Levine et al., 1986; Meredith et al., 1982)
- Service orientation (Duncan-Hewitt, 1996; McGaghie, 1990)
- Work habits (Levine et al., 1986; McGaghie, 1990)
- Supportive and encouraging behavior (Duncan-Hewitt, 1996; Powis et al., 1988)
- Responsible actions (Duncan-Hewitt, 1996; Levine et al., 1986)

- Problem-solving skills (Duncan-Hewitt, 1996; Levine et al., 1986)
- Character and Integrity (McGaghie, 1990; Hall & Bailey, 1992)
- Ethics (Hansen & Pozehl, 1995; Meredith et al., 1982; Levine et al., 1986)

Admission Information Sources

Information sources listed in the literature to assess quantitative and qualitative variables include grade point average, standardized tests, interviews, essays, recommendations, assessment instruments, and the presence of a prior four-year degree. Each of these information sources will be further discussed.

Grade Point Average

For the medical profession, Spooner (1990) suggests that the major role of academic criteria is to assess the ability of the prospective student to acquire, retain, and use an ever-growing and changing critical knowledge base through formal training and subsequent continuing education. Charupatanapong et al. (1994) report that the pre-pharmacy grade point average is the best predictor of professional program academic performance. This is likely because prior courses, teaching, and assessment methods are likely similar to those within the traditional classroom curricula of pharmacy programs.

However, there remains concern with grade point average as the sole admission factor due to the possibility of inconsistency among grading systems at prior institutions. Therefore, some authors have documented systems of adjusting grade point averages based on institutional averages. For

example, Hall and Bailey (1992) discuss the use of a system to rate undergraduate colleges as high, intermediate, or low selectivity. This system uses the mean Scholastic Aptitude Test (SAT) scores to group colleges. These findings suggest that the Medical College Admission Test (MCAT) and previous grade point average became more valid predictors when the college selectivity was used as a weighting factor. Kawahara and Ethington (1994) also described the use of a 'feeder school index' for pre-pharmacy programs. This system utilized the average MCAT scores for an institution.

Another option to adjusting grade point averages from institutions is the observance of consistency on the student's transcript. Spooner (1990) suggests that the key to good performance during the medical school career may be the use of a measure of academic consistency instead of utilization of the actual grade point average. For example, this author suggests that admission committees should consider consistent academic performance in each semester or term rather than the cumulative grade point average.

The type of college may also be a determining factor for successful completion of a professional school. Schmalz et al. (1990) found that applicants who attended a four-year undergraduate institution for at least two years prior to attendance at the professional school were more likely to successfully graduate than those who did not.

Despite adjustments in grade point average and consideration of prior institutions attended, concern continues to exist if grade point average is the only admission criteria. Classroom tests tend to predict, with a respectable validity, performance on classroom tests in other settings (Spooner, 1990). Since the final stages of a health professional's education consists of unsupervised and subjective criteria, academic criteria predictors appear to

lose their correlational power as the individual progresses through the curriculum (Duncan-Hewitt, 1996; McGaghie, 1990).

Standardized Tests

Standardized examinations exist to classify diverse institutions and aid admission committees to make equitable decisions in selecting candidates from various pre-professional educational institutions (Mitchell, 1990). Anderson (1990) explains that standardized tests exist because variations are present in the perceived qualities of course grades. Therefore, the exams intend to provide a uniform measurement of cognitive abilities and science achievement. For example, Hall and Bailey (1992) found that MCAT performance was a valuable leveler in the assessment of applicants from diverse colleges.

On the other hand, Cunny and Perri (1990) report that the use of standardized tests has been criticized in the consideration of marginal candidates since examination scores are not precise enough to differentiate between applicants who have "borderline" scores. Hansen and Pozehl (1995) also offer a criticism of standardized tests as a measure of communication abilities. These authors noted that verbal subscores on standardized exams are largely derived from vocabulary and grammar, and might not accurately reflect the communication ability necessary for a health care professional.

Pharmacy College Admission Test (PCAT)

The Pharmacy College Admission Test (PCAT) is a national examination program sponsored by the American Association of Colleges of Pharmacy (AACP). This test provides pharmacy program admission committees with comparable information about the abilities of applicants (Cunny & Perri, 1990). During the late 1960s and 1970s, increases in pharmacy

school enrollment created a need for an upgrade in the selectivity of the admissions process. This admission exam which was developed to measure achievement in areas critical in the study of pharmacy. The PCAT includes the content measured by most standardized admissions tests, as well as scientific subject matter in chemistry and biology (Psychological Corporation, 1993). The format of the present exam includes 50 questions on verbal ability, 65 questions on quantitative ability, 60 questions on chemistry, 50 questions on biology, and 45 questions on reading comprehension.

Advantages of using the PCAT center on the selection of suitable students and increased satisfaction of the faculty and student body (Cunny & Perri, 1990). The availability of additional applicant information on a common scale can help offset grade variability from feeder schools. Friedman, Lage, Norwood, and Stewart (1987) report the value of the PCAT for colleges of pharmacy who draw from diverse prepharmacy programs where grade point averages may not be comparable, and in evaluation of older, non-traditional, or transfer students.

Disadvantages include time, travel, and financial burdens for some prospective students. In addition, some schools consider the score report difficult to utilize or interpret (Cunny & Perri, 1990). Kawahara and Ethington (1994) also raise a concern because of a slight performance favor for males in the Chemistry and Biology sections. Thus, Duncan-Hewitt (1996) suggests that the PCAT should not be the only criterion for admission, but may be useful along with other admission information sources.

Tests of English

The TOEFL (Test of English as a Foreign Language) and the TSE (Test of Spoken English) are frequently used by institutions to evaluate the English

proficiency of people whose native language is not English. The TOEFL uses a multiple-choice format to measure the ability to understand North American English. This exam consists of listening comprehension, structure and written expression, and reading comprehension. On the TSE, examinees give oral answers to questions that are presented in written and oral form. Rather than requiring writing, spoken answers are recorded on tape (Educational Testing Service, 1997).

Interview

The interview allows admission committees to assess applicant strengths in attributes such as empathy, trust, and the ability to build relationships (Walker et al., 1985). Although the interview is subjective, it can be an important part of the admission process since health care professions rely heavily upon the ability to communicate on an interpersonal level (Blaisdell & Gordon, 1979). Few information sources are more helpful than the interview to evaluate affective variables (Spooner, 1990). Shahani, Dipboye, and Gehrlein (1991) suggest that the face-to-face interview is perhaps the most obvious approach to measuring these noncognitive attributes. These authors found a low correlation between paper credentials and interview evaluations indicating that the interview was identifying unique information which had little overlap with information already contained in the paper credentials. Edwards, Johnson, and Molidar (1990) suggest that the purposes of the interview are (a) information gathering about non-academic qualities; (b) decision-making regarding the selection of enrolled students with qualities capable of further development; (c) verification of other information submitted from personal statements, autobiographies, and

references; and (d) recruitment, particularly in the event of declining enrollments (Smith, 1991).

The interview process allows admission committees the opportunity to eliminate students whose group interpersonal skills are extremely poor, and thus may be inappropriate for entrance into the profession (Levine et al., 1986). DeVaul, Jervey, Chappell, Caver, Short, and O'Keefe (1987) also noted the advantage of an interview in eliminating undesirable candidates such as the psychotic or extremely inflexible individuals.

Furthermore, the interview also offers an opportunity for enhanced recruitment during periods of low applications. The recruitment aspect of the interview has become important to many institutions (DeVaul et al., 1987) since applicants are able to receive a global impression of the academic environment, the student body, the type and behavior of the faculty, and the many administrative and support personnel who will work with him or her for the next four years (Spooner, 1990).

However, during a study conducted by Shahani et al. (1991), the interview did not add any incremental value over test scores and grades when studying the predictive value on grade point average. Other concerns raised by DeVaul et al. (1987) regarded the subjectivity of the interview. Since a high cost in time, effort, and financial resources is expended by the institution, interviewers, and interviewees (Taylor, 1990), it is important that admission committees know the purpose of the interview and if unique information is provided about the applicants (Edwards et al., 1990). On the other hand, Gramet and Terracina (1988) found that the personal interview predicted cumulative professional grade point average. These authors reported that their study reinforced the importance of the presence of an interview despite the cost.

Smith (1991) also found that the interview did not predict selection of successful students, possibly due to flawed interviewing techniques. This author suggests that unless schools are willing to devote significant resources to training interviewers and employing highly structured interviews, they should consider dispensing with the interview for selection purposes. Therefore, the following sections discuss recommendations from the literature to improve the reliability and validity of the interview.

Structuring Methods

Interview formats can be grouped into three categories: structured, semi-structured, and unstructured. Structured interview situations appear to be the preferred method to increase the reliability and validity of the interview (Edwards et al., 1990; Elam & Andrykowski, 1991). Schools can increase structure, and therefore reliability and validity by (a) defining the job analysis, or qualities they are measuring, (b) standardizing the questions, (c) listing standard answers and corresponding ratings (behavioral anchors), and (d) using an interviewer panel to reduce interviewer bias (Edwards et al.).

Latham and Saari (1984) observed that the use of the interview as a selection device generally lacks reliability and validity since interviewees were not asked the same questions and if they were, the questions were not related to the job. When this did occur, the interviewers often could not agree on what constituted an acceptable answer. When they did agree, the acceptable answer to the question was frequently transparent to the interviewee. These authors report on two interview techniques that will increase the reliability of the interview: utilizing a situational interview that includes critical incident techniques, and requesting information about past behavior which will predict future performance. They found that a

relationship existed between intentions expressed during an interview and observations by others of the person's behavior.

The second recommendation by Edwards et al. (1990) is to standardize the interview questions. Standardized questioning refers to asking each candidate the same set of questions. This is recommended to allow for consistency among the applicants which will increase the reliability of the interview process (Elam & Andrykowski, 1991; Levine et al., 1986).

Reliability is also improved when descriptive statements of the interviewees' responses, or behavioral anchors are provided for each question. This has been shown to be possible through the coding of interviewers' narrative comments (Meredith et al., 1982). These authors determined that comments from interviews can be accurately rated. They found that when predicting narrative clerkship performance outcomes for medical students, admission interview comments were the best predictors. Providing Likert scale statements that describe the interviewee's comments have also been used and shown to be effective (Elam & Andrykowski, 1991; Levine et al., 1986; and Meredith et al.).

Using panels of interviewers increases the reliability of the interview. Richards, McManus and Maitlis (1988) demonstrated that when different panels of trained interviewers viewed the same video of interview interactions in the medical student selection process a high correlation existed (r=.901). In addition, when intrapanel interviewer ratings were compared, consistency among the raters occurred (r=.908).

Additional Recommendations

Two other strategies to improve the interview process include interviewer training, and interviewing applicants individually. Since one of

the potential functions of the interview is to measure qualitative abilities, Elam and Andrykowski (1991) suggest that training interviewers will aid in the measurement of qualities that are frequently more difficult to measure. These authors also report that interview training recommendations should place an emphasis on creating a friendly atmosphere, indicate an interest in candidates' views and feelings rather than on verbal ability, and ensure that all topics listed for discussion are adequately sampled.

Powis et al. (1988) suggest that interviewers have access to the applicant's name and age only. This serves to reduce interviewer bias and keep the interview focused on other topics besides academic achievement. These authors note that schools already are provided that information through grade point average and standardized test results.

Levine et al. (1986) describe a shift from an individual interview to a group interview of three faculty to five applicants to give an indication of applicants' interpersonal skills and to eliminate some of the time consuming aspects of the interview. Neither type of interview demonstrated statistically significant correlations with academic or clinical performance in a physical therapy professional program. The advantage of the interview for these authors was in eliminating those individuals who were grossly inappropriate for the profession.

Assessment Instruments

Instead of or in addition to interviews, some schools are utilizing or developing instruments to assess applicant characteristics (Duncan-Hewitt, 1996). The instruments, whether commercial or developed in-house, need to be fair and defensible. However, commercial standardized instruments may not meet the goals of the curriculum, have a different balance of goals, or

have contexts that are not appropriate to actual practice. Some researchers have found or developed assessment tools that predicted success in the professional program. For example, Schmalz et al. (1990) found that the Otis Quick-Scoring Mental Ability Tests predicted success in a physician's assistant program. Taylor (1990) reported an effective applicant evaluation form to assess personal qualities completed by evaluators of the individual's choosing as opposed to using an interview.

Duncan-Hewitt (1996) cautions the use of standardized personality tests and psychological instruments because of ethical, "fakeability," and intent issues of the instrument. In addition, over-reliance on assessment tools may result in a homogeneous population, a situation schools attempt to avoid because of the risk of stifling the profession's ability to adapt and change.

Duncan-Hewitt (1996) described an assessment of affective qualities which used a self-questionnaire format. Thirty-five descriptors of qualities possessed by successful practitioners, or pharmaceutical care practitioners were listed. Applicants were asked to list activities most important to them and then select the descriptors that best described the personal characteristics demonstrated in these activities. This author notes that the problem of valid assessments is difficult when measuring affective qualities such as motivation, commitment, and responsibility due to the possibility of "faking" the correct response. Unfortunately, the higher the face validity, the higher the "fakeability". To minimize this occurrence, Duncan-Hewitt (1996) suggests that assessments need to possess validity, relevancy and authenticity, balance, efficiency, specificity, correct difficulty, discrimination, reliability, and fairness. This author recommends the following methods for constructing an assessment: assess face and content validity by receiving the critiques of experts, choose criterion assessments to evaluate the criterion-referenced

validity of the items, pilot the items in a volunteer population, list the probable responses from this pilot group, develop corresponding answer keys by developing lists of desirable responses from the "experts", initiate standardized marking procedures, assess the reliability of the assessment by asking volunteer markers to assess the pilot responses and make changes to the key where appropriate, assess the criterion-referenced validity by comparing scores on the reference test and the constructed assessment item (using the correlation coefficient), determine usage of the item based on the validity comparisons, use the items, and assess the results.

Cocolas et al. (1997) describe the use of the Gordon Personal Profile-Inventory (GPP-I) of pharmacy students. This instrument provides reliable measures of eight personality traits: ascendancy, responsibility, emotional stability, sociability, cautiousness, original thinking, personal relations, and vigor. The pharmacy students' data were compared to active and less active pharmacists. Active was operationalized as those pharmacists who were external PharmD applicants, had an office in a pharmacy-related organization, or were pharmacy program preceptors. In this study, active pharmacists self-scored themselves higher on ascendancy, sociability, and original thinking. These authors recommended the addition of the GPP-I original thinking trait score for pharmacy program admissions to supplement the subjective measurement of interviews, written essays, and letters of recommendation.

Essay, Recommendations, and Previous Degree

Other information sources discussed in the literature include essay, recommendations, and the presence of a previous degree. These sources provide supplemental information to the other information sources.

Programs that do not have time to teach writing skills in the curricula and wish for students to possess it on admission to the college find that an essay can be valuable. Duncan-Hewitt (1996) described the essay as being useful in assessing written English communication skills; affective qualities such as community service, empathy, helping, orientation, responsibility; and an interest in or commitment to the pharmacy profession. While the PCAT verbal and reading subscales may measure the written English skills, students who are test-wise may appear to be better communicators than they actually are. In an evaluation of essay with PCAT English subscores, a 0.34 correlation was obtained indicating that different skills were assessed. In an attempt to provide an assessment that is valid and reliable, Duncan-Hewitt encourages the assessment be completed by trained evaluators.

Metge and Briggs (1997) developed, studied, and validated an essay component in their admissions process that assessed critical thinking and written skills. In this exercise, candidates read a brief scenario article and then argued for or against a proposition. This required that the students analyze the topic and develop a clearly written, logical response. Following that essay, the candidates wrote a structured, personal history which provided information on personal attributes.

Recommendations include letters of reference or recommendation forms. Baker et al. (1993) determined that letters of reference are helpful in distinguishing among all medical school applicants with better-than-average grades. For this program, the quality of reference letters is an important component of the pre-interview score in determining resident selection.

A previous four-year undergraduate degree may indicate academic success and therefore be a valuable information source for admission procedures. Most pharmacy students complete a two year pre-pharmacy

program prior to entering a professional pharmacy program. Thus, limited data exists on those that complete a four-year degree and their degree of success in pharmacy school (Chisholm et al., 1995). Therefore, these authors studied the relationship between the four year undergraduate degree and the academic performance of first year pharmacy students. Since students with this degree are typically older than the traditional student, the variable 'age' was also studied and did not have an effect on first year grade point average. Therefore, this study determined that a prior, four-year undergraduate college degree led to a significantly higher first year grade point average. Explanations for this occurrence were that these students may have had a different perspective and therefore, greater motivation for success.

Composite Indexes

Once the qualities and information sources are determined, McGaghie (1990) suggests the data be aggregated into indexes. Cunny and Perri (1990) suggest options in pharmacy student admission processes. One is to select candidates on academic ability assessed through a combination of prior academic performance and/or standardized examination scores. Another is selection based on subjective qualities such as experience, interest, motivation, concern for people, and adaptability to challenge. Because of the difficulty in assessing nonacademic factors, a third alternative which has been suggested is the random selection of candidates. It is unlikely that such a procedure would be tolerated in the United States, however, a weighted random selection process has been used in other countries (Cunny & Perri, 1990).

Mitchell (1990) suggests yet another option, the utilization of an initial process to screen applications who may have a high risk of academic failure. For example, standardized test scores and grade point averages minimums could be established to provide an initial screen for admission committees. Mitchell (1987) found that this screening was frequently used by medical schools. This author surveyed admissions officers and reported that standardized scores are used to identify students who qualified for further consideration. These test scores were then used in conjunction with other information sources such as grade point and interview score to determine the candidate's admission status (Mitchell, 1987).

DeVaul et al. (1987) described a process where an assistant dean for admissions screened medical school applicants for likelihood of academic success. This occurred by taking into account academic performance, pre-professional advisor assessments and extracurricular or work-related activities. The second step in this admission process consisted of interviews with those candidates who met the initial screening criteria. Thus, the screening provided efficiency to the admission process.

Graham (1991) suggests variables that may be useful in screening applicants for admission to a Masters in Business Administration (MBA) program. Those variables were the Graduate Management Aptitude Test (GMAT) along with junior/senior grade point average (instead of the entire four year grade point average). However, this author cautions that the combination of these variables were only able to explain one-third to one-half of the variance in grade point average. This indicated that a great deal of latitude for qualitative assessments of a student's potential should be performed by the selection board or admission committee.

Blaisdell and Gordon (1979) developed a model of objective and subjective factors using discriminant analysis to determine successful completion, withdrawal, or inconclusive action of a candidate in school. Each case was categorized further on the basis of the results of multiple regression analysis. Those candidates screened through this objective model were assessed through an interview or another subjective method. The benefits of using a model such as this are (a) individuals are classified, (b) other institutions can generalize it to their situation, (c) the admission process is streamlined, and (d) provision of an indicator of future success and therefore, continuation of the profession is implied (Blaisdell & Gordon).

Once the determination for an initial screening is made, the next decision is the importance of the information sources, characteristics, and other data. In 1986 and again in 1993, medical school admission officers were asked to list the sources of information considered in processing applications and to categorize preadmission variables as high, medium, and low importance in selecting students (Mitchell, 1987; Mitchell, Haynes, & Koenig, 1994). Those information sources that were of high importance in both of these reports were total undergraduate grade-point average; grade point average in biology, chemistry, physics, and math; ratings from medical school interviews; involvement in and the nature of non-health-related extracurricular activities; and MCAT scores. Other important sources in 1986 included the quality of the degree-granting institution, involvement in and the nature of non-health-related extracurricular activities, involvement in and the quality of health-related work experience, state of residence, and breadth and difficulty of undergraduate course work. The only other information sources considered important in 1993 were knowledge of health care issues and commitment to health care.

Several authors have documented the use of a regression equation to predict success in the professional program. As these equations are developed, the various information sources that provide the most predictive data are weighted according to their predictive value. Duncan-Hewitt (1996) suggested that non-academic criteria should have at least a weight of 40% to be worthwhile in having an influence on the admission decision.

Ranking and Categorizing of Data

McGaghie (1990) suggests that professional programs should realize that quantitative and qualitative data can be ranked or categorized. Examples of categorical data are gender, race, yes/no questions regarding athletic history, and leadership positions, while the latter includes ranking of undergraduate institutions.

Stumpf and Liskin (1994) also suggest the use of a ranking system to provide efficiency in decision-making since faculty time is taxed at the data collection stage. In a study completed by these authors, two alternative methods, ranking vs. voting, were examined for selecting students into a physician assistant program. This study showed that the numerical ranking scheme had a significant correlation (.89, .77, .87) with the time-consuming voting process. This occurred without compromising each selector's privacy in the weighting of selection criteria.

Predictability Studies

Once the admission process is determined, predictability studies can be helpful to evaluate the criteria and make changes if needed. Charupatanapong et al. (1994) suggest the use of predictability information to help admission committees select incoming students for their programs.

These authors also report that various studies have been conducted to guide admission committees in selecting potentially successful incoming pharmacy students. Unfortunately, much of the current literature in health care fields does not indicate which criteria predict student success in an educational program (Schmalz et al., 1990). Therefore, Friedman et al. (1987) recommend that local institutions need to undertake their own research to validate the use of information sources for their programs and methods of rating those sources on a periodic basis. In the newly adopted accreditation standards, ACPE (1997) also encourages the use of local studies that relate admissions criteria with student achievement in the professional program in pharmacy and performance in professional practice.

In a review of literature, Mitchell (1990) found that medical school studies used the criterion variables of basic science grades, clinical grades, Board examination scores, or incidence of academic difficulty. Academic difficulty was defined as delayed graduation or withdrawal/dismissal from medical school. Meredith et al. (1982) note that prediction formulas will vary depending on what outcome variables are chosen. If the program is only interested in predicting an objective knowledge measure such as a board score, then only the more traditional objective measures should be considered at the time of admission. Hansen and Pozehl (1995) note that it is important for schools to develop admission criteria that predict success in the program including completion, high achievement in academics, and effective performance in the professional role.

Following is a discussion of published predictability studies comparing admission data to each of these criteria variables. These studies are summarized in chart format in Appendix B.

Basic Science Grades and Didactic Course Work

GPA Studies

A number of studies demonstrated moderate to strong correlations between undergraduate and professional grade point averages. Mitchell's (1990) review discussed the substantial predictive value that traditional academic criteria had with performance in medical school, particularly correlations to the earlier years of medical school. Hall and Bailey (1992) reinforced the predictive validity of admission criteria in their study with first year medical students. Seventy percent of the variance of first year grade point average was explained by the undergraduate grade point average. Levine et al. (1986) found science and cumulative grade point averages had a moderate influence on cumulative professional grade point average. Chisholm, Cobb, and Kotzan (1995) determined that the pre-pharmacy science grade point average was much more predictive than overall pre-pharmacy grade point average for their institution's students.

Standardized Tests

Standardized test scores have also been shown to be good predictors with didactic course GPAs. Friedman et al. (1987) defined success in pharmacy school as the first-year professional grade point average and found that at several colleges the PCAT alone served as a better predictor of first-year pharmacy GPA than prepharmacy grade point average alone. Graham (1991) reported a correlation between the GMAT score and graduate GPA, particularly when combined with the undergraduate GPA. Hansen and Pozehl (1995) demonstrated that the Scholastic Aptitude Test best predicted cumulative grade point average in their program's nursing students.

GPA and Standardized Tests

The combination of GPA and standardized exam scores appears to strengthen the relationship with professional grade point. Hansen and Pozehl (1995) found that the didactic course graduate grade point average for nursing students was predicted by the non-nursing undergraduate grade point average and the GRE score. Prediction of first year academic performance in medical school is highly correlated with undergraduate science grade point average, Medical College Admission Test (MCAT) scores, and the student's academic caliber (Hall & Bailey, 1992). Bandalos and Sedlacek (1989) found that required pre-pharmacy course grade point average, source of the prepharmacy institution and the PCAT biology and verbal aptitude scores were the significant influencing variables on professional grade point average.

Interview

Studies have determined that a significant correlation does not exist between the interview and academic performance in the professional preclinical curriculum (DeVaul et al., 1987; Levine et al., 1986; Walker et al., 1985). Smith, Vivier, and Blain (1986) and Smith (1991) compared first-year medical school performance of students admitted with interviews to those admitted without interviews. These authors determined that the elimination of the interview did not adversely affect the students' first year grade point averages, or the number of distinguished or deficient grades. Another study compared initially rejected students who had low interview ratings with initially accepted students. A significant difference was not present in matriculation, progression through the curriculum, and performance in pre-clinical, clinical, and first year post-graduate experiences occurred (DeVaul et al., 1987). Walker et al., (1985) opine that if the interview had predicted

performance in the professional preclinical course work, then it would have been a duplication of other measures used for that purpose.

While the interview does not appear to predict total grade point average, there may be a relationship with specific courses that have qualitative components. Shahani et al. (1991) found the undergraduate admission interview lacked a correlation with overall grade point average. However, a relationship did exist with non-quantitative courses such as speech and composition. This suggests that interviews measure other factors besides grade point average and may be important predictors of success in non-quantitative areas.

Multiple Sources

Several authors have researched multiple variables and sources to determine those of highest significance. In a study utilizing multiple regression techniques, Gramet and Terracina (1988) determined the following predictor variables for cumulative professional grade point in physical therapy applicants: high school grade point average, age at entry (.40), preprofessional cumulative grade point average (.46), and personal interview (.50). Duncan-Hewitt (1996) found that predictor variables for the first year GPA was English essay, PCAT verbal, PCAT reading, an affective descriptor item instrument and overall pre-pharmacy GPA.

Other studies have shown relationships between demographic data and professional grade point average. Wu-Pong et al. (1996) found that language status was not a significant predictor of grade point average. However, in this study the level of applicants' English language competence was not measured, only if English was or was not the first language. Charupatanapong et al. (1994) reported that pre-pharmacy grade point average

is the best predictor of overall white and Asian pharmacy students' academic performance for all three professional years, whether the student was married or single. Older and African-American students' grade point averages were most predicted by the number of hours contributed to community activities. Students who had lower pharmacy academic performances (GPA <3.0) were more likely to be older, work more hours during the academic year, study less hours per week, and contribute more hours to both college and community activities. No single group of variables consistently predicted pharmacy students' academic performance across demographic variables.

Caution exists with using admission criteria in comparison with grade point average as the only outcome measure of the admission process. Hall and Bailey (1992) note that the preclinical curriculum is only the start of a lifetime of learning and encourage admission committees to compare admission criteria to other criterion variables in addition to GPA.

Clinical Grades

Along with academic achievement, problem-solving aptitude and communication effectiveness are important skills for the success of the health care professional. Walker et al. (1985) note that the clinical experience, rather than grade point average, most closely resembles a practice situation. A number of studies relate grade point average, interview scores and other information sources to this point in the curriculum.

GPA Studies

Baker et al. (1993) determined that traditional academic criteria were not sufficiently predictive of clinical performance or interpersonal skills. These authors reported that the interview and letter of reference scores were

consistently higher for matched candidates than the standardized test scores, grades, and class ranks.

Likewise, Hansen and Pozehl (1995) found that the non-nursing undergraduate GPA predicted the clinical grade point average of nursing students. When the graduate performance rating scale, another measure of clinical success was used, the non-nursing undergraduate grade point average only predicted two of the eight individual assessment variables. Thus, it was determined that other factors besides grade point average likely predict clinical success.

Interview

Several studies evaluated the interview rating to the clinical performance of the students. When interview ratings were compared to non-academic measures, positive correlations frequently occurred. Baker et al. (1993) ranked anesthesiology residents on traditional academic criteria alone, and found that clinical performance was not sufficiently predicted. These authors concluded that other qualitative factors should be considered in the selection process. Meredith et al. (1982) found a correlation between interview ratings and clinical competency scores for medical students.

Walker et al. (1985) determined that correlations between interview and course work gained significance in the clinical phase of the dental curriculum. An increase in patient interaction occurs at this point in the curriculum, indicating that other non-academic measures such as empathy, trust, and the capacity to build relationships are important. Thus, they concluded, it appeared that the interview began to predict performance when students were involved in clinical situations. Likewise, Ziedner, Kremer-

Hayon, and Laskov (1990) also found that interviews increased in correlational ability when compared to clinical course work.

Levine et al. (1986) compared physical therapy students' pre-professional grade point averages and interview scores with their academic and clinical success in the program. A moderate correlation existed between the interview verbal communication score and clinical grades.

Hall, Regan-Smith, and Tivnan (1992) documented that the interview was shown to predict their institution's dean's letter ratings. Medical school deans often compose letters of recommendation during the student's residency application process, relating the assessment to success in the clinical curriculum. A strong performance in admission interview was reflective of these students' letter ratings in the top third of the class, while poor admission interview performance was associated significantly with the dean's letter ratings in the bottom two-thirds of the class. This study suggested that the interview is an effective evaluation tool for identifying those students who will do less well, while indicating less predictability for identifying those students who will do well on their dean's letter ratings. Therefore, the interview rating may be more powerful for indications of failure as opposed to success. These results also showed that the admission interview score in the admission selection process provided value-added information which was more predictive of future dean's letter ratings than the other variables tested.

Most of these studies illustrated the value of the interview as a tool in helping the program select students who had the non-cognitive qualities to succeed in settings where other skills along with knowledge were necessary. In addition, some of the studies found that the interview may help more in the elimination of students rather than their selection.

Only one study demonstrated that although the admission decision was due to interview score, a difference did not occur between initially-rejected and initially-admitted students.

Other Information Sources

Studies have also incorporated attitudes, age, and first language into prediction formulas. Inglehart and Brown (1990) found that professional identity factors improved the clinical course work scores. Those factors affecting this criterion variable included the importance of the career selection to one's parents (negative correlation), the student's focus on becoming a physician, and self-related factors for selecting medical school candidates.

Hansen and Pozehl (1995) found that age was a significant negatively correlated variable with their graduate performance rating scale (GPRS), a measure of clinical performance evaluated at the point of graduation. Wu-Pong et al. (1997) considered honors received at graduation to be a measure of clinical performance. This measure was not affected if English was or was not the first language of the student.

Licensure Exam Score

Research has also been completed comparing information source ratings to licensure exam scores. When grade point average, standardized test scores and interview were tested with licensure exam score, the grade point average and science-quantitative MCAT correlated significantly (Meredith et al., 1982). Ziedner et al. (1990) demonstrated a correlation between aptitude test scores and the licensure exam scores of medical students. Although admission decisions were due to interview scores, DeVaul et al. (1987) found

that no difference existed in licensure exam scores between initially-rejected and initially-admitted students in their study.

Inglehart and Brown (1990) found that professional identity factors predicted licensure exam score. The identity factors that were found to affect this criterion variable were the importance of the career selection to one's parents (negative correlation), the student's focus on becoming a physician, and self-related factors for selecting medical school candidates.

Completion of Program

Another category of success was completion of the program, or conversely, the lack of incidence of academic difficulty or withdrawal. Powis et al. (1988) completed a study which compared the admission interview rating with the grade point average of withdrawn medical students. Those students were matched with students who successfully completed the program. The students who withdrew or had difficulty completing the program were significantly lower in their interview ratings than their matched controls. Powis et al. surmised that a prediction could have been made based on the interview scores since it indicated that these students did not have the motivation or perseverance to progress through the curriculum.

Blaisdell and Gordon (1979) also studied the difference between students who persisted and those who withdrew. The predictor variables for those who persisted included: (a) subject interest in the life sciences, (b) support score on the SIV (survey of interpersonal values), (c) the presence of an anthropology course, (d) percent of high school graduates going to a 4 year college (negative relationship), (e) subject interest in math and social science courses, and (f) SIV conformity score.

Schmalz et al. (1990) studied occupational therapy candidates who had successfully completed their degrees. these authors used admission variable scores and multiple regression statistical procedures and found the following variables to be predictors: Essay (.76), CumGPA (.80), institution (.85), and OTIS (Otis Quick-scoring mental ability test) (.90). Physician's Assistant students scores on the OTIS (.92) predicted successful completion of their program.

Predictability Study Recommendations

The literature indicates the following regarding information sources and their predictive qualities for student success:

- Grade point average (Hall & Bailey, 1992) and standardized tests (Friedman et al., 1987) predict first year grade point (Bandelos & Sedlacek, 1989; Hansen & Pozehl, 1995).
- Interview score predicts success in non-quantitative courses (Shahani et al., 1991) and clinical year scores (Baker et al., 1993; Levine et al., 1986; Meredith et al., 1982; Walker et al., 1985; Ziedner et al., 1990).
- Grade point average and standardized exams predict Board scores (Meredith et al., 1982; Ziedner et al., 1990).
- Academic difficulty/withdrawal may be predicted by interview (Powis et al., 1988), subject interests (Blaisdell & Gordon, 1979), essay, cumulative grade point average, standardized exams (Schmalz et al., 1990).
- Studies that compare admission information source scores with success as a practitioner are recommended (ACPE, 1997). However, few studies have been published, perhaps because it is difficult to define success as a practitioner. Cocolas et al. (1997) defines successful pharmacy practitioners as those who are external PharmD applicants, have an office in a pharmacy-related organization, or are pharmacy program preceptors.

Conclusions

The admission process for health care professions is an important aspect of the future of the profession. This process needs to be effective and efficient since most individuals admitted into health care education programs enter the profession, curricular limitations exist to develop all of the graduate's necessary skills and characteristics, and the system needs to minimize financial and time resources.

Various changes within the profession and education are necessitating the need for changes within pharmacy admission practices. The pharmaceutical care philosophy of practice, adoption of new accreditation standards, changes in higher education teaching methods, and more applicants than spaces available imply that applicants need to be evaluated by other sources as well. The literature discusses qualitative information sources such as interview, essay, assessment tools, and references as important aspects of the admission process. These information sources can determine the presence of skills and characteristics which are difficult to assess by grade point average and standardized tests.

Several studies in pharmacy and the other health care professions describe practices for use of these information sources as well as systems to combine and weight the qualitative and quantitative information sources. Many schools utilize a screening process of quantitative information followed by selection using qualitative information sources.

An important aspect of the admission process is the assessment or evaluation of how well the admission practice predicted success in the program or as a practitioner. Success in the program can be defined as

professional grade point averages, clinical rotation performance, licensure examination scores, or successful completion of the program.

This literature review did not reveal admission practices specific to pharmacy or changes expected in the future. This may be of particular interest considering the impending implementation of the ACPE new accreditation standards. Therefore, this study attempted to provide this body of knowledge.

Chapter 3

METHODOLOGY

The purpose of this study was to describe and analyze the current and anticipated changes in admission practices among United States pharmacy programs offering the entry-level PharmD degree. A survey design using comparative and correlational data was utilized. This chapter will discuss the study population, data collection, and data analysis.

Study Population

This study's population consisted of the pharmacy programs (AACP, 1996) who admitted entry-level PharmD students for the fall of 1997. Due to the small number of programs and the potential low response rate, all pharmacy programs were surveyed. Thus, all 78 pharmacy programs were sent surveys and asked to complete it if they admitted students into an entry-level program for fall 1997. The survey instructed respondents to return the survey unanswered if they did not admit students into an entry-level program. Each institution was contacted by the researcher to determine who should receive the survey. Once that list was compiled, electronic communication was sent to each individual confirming their appropriateness for receiving the survey and to inform them that the survey was forthcoming. This allowed the respondents to indicate if another person at the institution should complete the survey or if they anticipated any difficulty in meeting the proposed deadline for completion.

In an attempt to indicate the importance of this survey to the professional educational environment and increase the response rate, the cover letter informed respondents of the dual sponsorship of the study by AACP and ACPE, both national pharmacy education organizations. The cover letter also informed respondents of the anonymity of the survey in the event that answers would be influenced by the survey sponsorship. One week following the deadline for returned surveys, the 40 unresponsive admission contacts were contacted via telephone and requested to complete the survey. If necessary, a second survey instrument was mailed.

Data Collection

Instrument

A cover letter (Appendix C) and an author-constructed survey (Appendix D) were mailed to the identified respondent at each pharmacy program. Since a survey of this nature had not been previously completed with pharmacy programs, an author-constructed survey was developed with questions corresponding to each research question. A similar survey developed by Mitchell (1987) was used for guidance of format. However, the focus and research questions of Mitchell's study were directed toward the usage of the Medical College Admission Test (MCAT). Thus, different questions were necessary for this study's instrument. Therefore, this survey included questions regarding the current and future importance and weight of each of the admission information sources, desired applicant characteristics, program assessment activities, and program demographic information.

Reliability and Validity of the Survey Instrument

While reliability and validity data were not available for Mitchell's (1987) instrument, this study's survey was assessed for content validity and reliability. Thus, a variety of resources were used to assure the validity and reliability of this study's instrument.

Validity measures.

Content validity was enhanced by evaluation and pilot testing with experts in the field of pharmacy and a sample of respondents. The experts included representatives from the national organizations APhA and ACPE. In addition, the AACP Institutional Research Committee, composed of research staff and institutional members, assessed this study's author-constructed survey. The survey was also pilot-tested with admission committee representatives from five pharmacy programs. Following feedback from these individuals, changes were made to the survey prior to its dissemination to the rest of the target population. The changes consisted of clarifying items such as licensure scores (which was previously Board scores), and adding 'required pre-pharmacy grade point average' to the first survey question. Other items such as organizational leadership and volunteer work were considered self-explanatory according to the pilot group and experts. Thus, clarification for these terms was not included on the survey.

Reliability measures.

A number of questions assured the reliability of the instrument. These included the following pairs of questions and their correlations:

- interview importance with oral communication skills
- essay importance with written communication skills importance

- organizational leadership importance with leadership quality importance
- volunteer work importance with service orientation

The following table demonstrates the correlations of these various reliability tests as well as the significance of the correlation by the Fisher's r to z test for significance.

Table 2

Correlations of selected instrument questions

Variable pair	Correlation
Interview 97 - Oral Communication Skills 97	.469*
Interview 2000 - Oral Communication Skills 2000	.471*
Essay 1997 - Written Communication Skills	.177
Essay 2000 - Written Communication Skills	.204
Organizational Leadership 1997 - Leadership Skills 1997	.397*
Organizational Leadership 2000 - Leadership Skills 2000	.402*
Volunteer Work 1997- Service Orientation 1997	.276*
Volunteer Work 1997-Service Orientation 2000	.244

*$p < .05$

More than half of the variables had significant correlations for 1997 and/or 2000. While these values were significant, a high correlation did not exist. This is possibly due to the other ways to measure these attributes and skills than these information sources. Likewise, these information sources may assess other qualities besides those used in the correlation analysis. Unfortunately, not all items could be inter-correlated and thus general

reliability comments or additional reliability data on the instrument are unable to be provided. However, the significant inter-item correlations provide evidence of some internal consistency which is appropriate for the first time use of this author-constructed instrument.

Survey Questions

Demographic information sought on the survey included the format of degree program (0-6, 2-4, etc.); date of last accreditation evaluation visit; type of institution (private or public); and applied, accepted, and enrolled student numbers for the fall 97 entering class. These questions were asked to provide descriptive information of the population. Furthermore, these variables were examined for differences in admission practices between the categories. Therefore, each of the research questions was tested to see if a difference existed between private and public institutions, pre-pharmacy and no pre-pharmacy programs, date of last accreditation evaluation visit, and enrollment ratios. These demographic variables were tested with the information sources used, qualities sought and the information sources to assess those characteristics, and the assessment/validation practices. Statistical analyses included t-tests, Chi squares, contingency tables, and ANOVA.

Many of the questions were formatted into a chart with columns for current and future practice. The directions for each question listed the action the respondent should follow, such as "check the information source used, circle the importance of this quality, or list the source utilized." While the admission practices contained within the literature were listed in this survey, it was recognized that a great deal of diversity likely existed. Because of this possibility, many of the questions included cells in the charts for other responses and further descriptions. Likewise, respondents were provided a

space at the end of the survey to provide comments regarding admission procedures which were not specifically addressed in the survey questions.

Research Questions

The research questions were addressed on the survey in the following manner:

1) Does the current use of qualitative and quantitative information sources by colleges of pharmacy in their admission practices differ from expected practices in the future? Mitchell's (1987) survey was used as the prototype for questions to answer this question. A chart on the survey listed the information sources compiled from the literature review: GPA, standardized exams, student interviews, essay, recommendations, foreign language tests, instruments to assess characteristics, and extra-curricular activities. Respondents were asked to circle the Likert scale number corresponding to the importance of the source in the admission decision for the entering 1997 and 2000 classes. The scale used was 1 (no importance) to 5 (high importance). The grade point average section queried the use of high school, pre-pharmacy cumulative and pre-pharmacy science grade point averages. The standardized test score section included PCAT, TOEFL, and TSE. The essay section queried the use and importance of essays at the time of application or interview. Recommendations included those from personal or professional contacts. Assessment instruments, including institution-specific instruments to measure characteristics (Duncan-Hewitt, 1996), as well as extra-curricular activities were also listed.

Informational questions were listed regarding each of the following sources: grade point average, interview, essay, and recommendations. Respondents were asked to answer them if they currently utilized or expected

to utilize that particular information source. The questions regarding grade point average included the presence of a minimum grade point average and if the type or academic caliber of previous institutions accounted for any adjustments in the grade point calculation.

Interview questions referred to the structure of the interview, who is interviewed and how many times, who interviews the applicants, the type of questions asked, and interviewer access to applicant files. The structure of the interview questions addressed the standardization of the questions to each applicant and how many applicants are interviewed at one time. The use of situational and achievement questions was requested, in addition to questions which related to every applicant being interviewed and how many interviews each applicant participates in. The last interview question asked how much information is provided to the interviewers.

The question relating to the essay procedure asked if applicants are notified of the topics prior to the writing. Questions which related to references queried if a standard form or letters of reference were required.

2. Is there a significant difference between the importance of non-academic qualities that pharmacy schools currently assess in applicants and those they expect to assess in the future? This was determined by listing the qualities reported in more than one literature source from Appendix A. Respondents were asked to circle the weight of importance for those qualities using a Likert scale where 1 indicated no importance and 5 equaled high importance. Since it was possible that not all characteristics sought in the admission process were listed, several "other" cells were listed.

3. Will pharmacy schools' future use of information sources to assess non-academic qualities differ from current use by pharmacy programs? Survey question number 7 was composed of a chart for respondents to

indicate how important each characteristic was in the admission process at their respective institution. This chart also listed the information sources documented in the literature which included interview (McGaghie, 1990), essay (Duncan-Hewitt, 1996), assessments (Duncan-Hewitt, 1996), and references (Baker et al., 1993).

4. Is there a difference between the current and future assessment and validation of admission processes by pharmacy schools? Survey question number 8 addressed the local prediction and validation studies the institution is completing and plans to complete to validate/assess the information sources and ratings in the pharmacy program. Mitchell (1990) listed professional grade point average, clinical year evaluations, licensure exam scores, successful completion of program, and post-graduate success as the most frequently assessed criterion variables for correlational or predictability studies. Although the literature only includes a few studies relating to post-graduate success, institutions may be conducting local studies related to this criterion variable. Thus, success as a pharmacist was also listed. An "other" category was also provided to allow for individual institution procedures that involve other assessments

Data Analysis

All of the questions are summarized through descriptive statistics in chapter 4. Additional statistical procedures were utilized with each individual research question and are also described in chapter 4.

1. Does the current use of qualitative and quantitative information sources by colleges of pharmacy in their admission practices differ from expected practices in the future? The classification of an information source

as either quantitative or qualitative was determined by the literature review. Quantitative information sources included the following: (a) grade point average (Charupatanapong et al., 1994; McGaghie, 1990; Spooner, 1990), (b) standardized exams (Anderson, 1990; McGaghie, 1990; Mitchell, 1987), and (c) foreign language exams (Wu-Pong et al., 1997). Some schools may consider standardized exam verbal subscores to be a qualitative information source, however Hansen and Pozehl (1995) note that these subscores assess vocabulary and grammar rather than communication skills. An exception to this classification was considered if communication courses such as speech or English were listed in the "other" area of the survey's grade point average section. Shahani et al. (1991) reported that correlations existed between interview scores and speech and English course grades which indicates that these courses may measure qualitative information rather than quantitative. Therefore, if communication courses were listed in the survey's 'other' areas, their scores were added to the qualitative score.

Qualitative information sources were also determined by the literature review. This category consisted of (a) interview (McGaghie, 1990; Mitchell, 1987; Spooner, 1990), (b) essay (Duncan-Hewitt, 1996); (c) recommendations (Baker et al., 1993), (d) personality profiles (McGaghie, 1990), (e) other assessments (Duncan-Hewitt, 1996; Schmalz et al., 1990; Taylor, 1990), and (f) extra-curricular activities (Duncan-Hewitt, 1996).

A qualitative/quantitative admission score index was determined for each school. The index was calculated by adding the weights of the quantitative scores together. The same occurred for the qualitative index. The quantitative score was given a negative value to offset the qualitative score. These two individual indexes were then added to determine a total

qualitative/quantitative index. This index was developed the following manner:

$\underline{\text{Quantitative Score}} = \text{GPA}_{\text{HS-PP}} + \text{PCAT}_{\text{Subscores}} + \text{Foreign Language}_{\text{TOEFL/TSE}}$

$\underline{\text{Qualitative Score}}$ = Interview + Essay + Recommendations + Personality Profiles + Extracurricular Activities

$\underline{\text{Qualitative/Quantitative Index}}$ = Qualitative Score - Quantitative Score

A paired t-test statistical procedure was calculated to assess if a significant difference occurred between current and future responses.

In addition, t-tests were run on each individual information source such as high school grade point average, cumulative grade point average, and etc. Because multiple t-tests were used on this data, the alpha (p) level was adjusted. Therefore, .0024 (.05/21) was used as the p-value in determining significance (Godfrey, 1992).

To determine which information sources tended to occur together, factor analysis was used. The factor analysis model selected for this test was common factor analysis with an oblique rotation. Because this sample size was less than 100, the lowest factor loading to be considered significant was $\pm$.30 (Hair, Anderson, & Tatham, 1987)

Questions 3 through 6 on the survey asked specific procedural questions regarding the admission practices for grade point average, interview, essay, and references. Since most of the questions are in yes/no format, Chi Square was used to determine significant changes with t-tests being utilized for the numeric responses.

2. Is there a significant difference between the non-academic qualities that pharmacy schools currently assess in applicants and those they expect to

assess in the future? A total quality score was determined for each program by adding each individual quality importance score. The following equation illustrates this calculation:

$$\text{Total Quality Score} = \text{Importance Scores}_{\text{character+integrity+service orientation+etc.}}$$

Paired t-test procedures were used to compare the current and future total quality scores. This statistical procedure was also completed on the mean of the individual current and future quality scores. The alpha level was adjusted to reflect the 15 t-tests compiled on the data. The adjusted alpha level for significance was .0033 (.05/15).

3. Will pharmacy schools' future use of information sources to assess non-academic qualities differ from current use by pharmacy programs? The information sources listed by each institution for the various factors are listed and summarized in chapter 4. Each information source received a point for each response. If the institution used more than one source to gain the information, each information source received a point. The current information source scores were then compared to the future using the t-test statistical procedure. Any responses to the "other" question were coded in a qualitative study format.

4. Is there a difference between the current and future assessment and validation of admission processes by pharmacy schools? The number and percent of schools using each of the criterion variables listed in the literature review was calculated. The chi-square statistical procedure was used to determine the significant differences between current and future assessment procedures.

Conclusion

This chapter has summarized this study's population and respondents, and data collection and analysis. The respondents are the admission committee chairs at the pharmacy programs in the United States who completed an author-constructed survey. This survey contained questions regarding the importance and weight of information sources, specific questions about each of the information source procedures, affective characteristics sought, and local predictability studies. These questions varied in a Likert scale, multiple choice, yes/no, and open-ended format and provided opportunity for current as well as future responses. Inter-item correlations provided an assessment of the instrument's reliability, while content validity was enhanced by the use of experts and pilot-testing procedures. The data analysis included descriptive and inferential statistics to compare current with future practices. The primary inferential statistics used were paired T-tests, factor analysis, correlations, and chi-square.

Chapter 4

ANALYSIS OF DATA

This chapter contains the statistical analyses performed on the data which assisted in answering the research questions. The information presented in this chapter is divided into the following sections: (a) data collection procedures, (b) demographic information, and (c) descriptive and inferential statistics of current and anticipated changes in pharmacy school admission practices.

The purpose of this study was to describe and analyze the current and anticipated changes in admission practices among United States pharmacy programs. This included an assessment of the presence of studies that relate admission criteria with student and/or practitioner achievement. This was accomplished through the use of an author-constructed survey completed by identified respondents at each college of pharmacy.

Data collection procedures

All 78 accredited pharmacy programs in the United States were sent the initial mailing containing the survey regarding entry-level PharmD admission practices. Those institutions that admitted students into an entry-level PharmD program for Fall of 1997 were asked to complete the survey, while those that did not have a PharmD were asked to send the uncompleted survey back. Based on the list of anticipated degree offerings as published in the Pharmacy School Admission Requirements (AACP, 1997), it was expected

that 64 programs would complete the survey. Since the possibility existed that some schools may have delayed their transition to the new degree as well as others may have made the transition at an earlier point in time it was felt that the extra mailings would provide for a more accurate data base.

The cover letter and survey (Appendices C and D) were sent to the completed list of institutional contacts with directions to return the survey within one month. At the end of the month, an electronic communication, follow-up cover letter (Appendix E) and another survey were sent to each of the institutional contacts identified as offering entry-level PharmD programs through the Pharmacy School Admissions Requirements (AACP, 1996). Those schools not listed as offering entry-level PharmD programs in this publication were contacted and that information was verified. If so, their institution was then deleted from the list of possible schools with entry-level programs. The programs that did not complete the follow-up survey were contacted via telephone and personal contacts.

Demographic Data

Seventy-eight colleges of pharmacy were surveyed using the author-constructed instrument (Appendix B). Sixty-four of those schools were expected to offer entry-level PharmD programs according to AACP (1997) data. However, four of the 64 schools sent back their survey indicating that they did not admit entry-level PharmD students for Fall 1997. Fifty-five of the 60 remaining schools with entry-level PharmD programs completed the survey for a response rate of 92%.

The number of public institutions that responded was 37 (90% of the population) while the number of private institutions was 18 (95% of the

population). The following information describes the institutions represented in this study based on program format, most recent ACPE accreditation visit, respondents' perceptions that programs are already following the newly adopted ACPE 16.3 and 16.5 guidelines and utilization frequency of each information source.

Missing Values

If a respondent did not complete a section for either current or future information, it was assumed that the program did not use that information. If a respondent completed the current portion but not the future, it was assumed that no changes were expected and the current information was used.

Program Format

A high percentage of the schools without pre-pharmacy programs and those with pre-pharmacy programs of various formats responded. The sample response rate from each of the program format categories varied from 88-100%.

Table 3

Program Format of Respondents and the Population

	Respondents	Population	% of Population
No Pre-pharmacy (0-4, 0-6, 0-7)	7	8	88%
One Year Pre-pharmacy (1-5)	2	2	100%
Two Years Pre-pharmacy (2-4)	44	50	88%
Track-in after 4 years (4-2)	2	2	100%

ACPE Visits

All of the institutions have had an ACPE accreditation visit in the past 7 years. Sixty-four percent of the programs were visited since the beginning of 1995.

Table 4

Last ACPE Accreditation Visit

Year	Number of Schools with Visits
1991	5
1992	3
1993	6
1994	4
1995	6
1996	13
1997	14
1998	2
Missing cases	2

Following of standards

Eighty-two percent of the institutions believe that they are already following the newly adopted ACPE 16.3 and 16.5 guidelines based on survey question 14. Four of the schools were not aware of the standards, while five of the institutions were in the process of making changes to meet the standards. Table 5 illustrates the number of programs and percent answering each response.

Table 5

Believe that Institution is Already Following ACPE Guidelines 16.3 and 16.5

Response	Number of programs (%)
Yes	42 (82%)
No	5 (10%)
Unaware	4 (8%)

Admission Ratios

The applicant/accepted ratio calculated from the values provided from the schools was 3.24:1 with a standard deviation of 1.41. The applicant/enrolled ratio calculated from the values provided from the schools had a mean of 3.81 applicants to every one admits with a standard deviation of 1.53. The admitted to enrolled ratio was 1.21 with a standard deviation of .33.

Table 6

Admission Ratios

Ratio	Mean	Standard Deviation	Range
Applicants/Accepted	3.24:1	1.41	1.037-7.692
Applicants/Enrolled	3.81:1	1.53	1.053-7.843
Admitted/Enrolled	1.21	.33	1.00-2.413

Information Sources Used in Admission Practices

The highest utilized information sources for the current and future reported practices are organizational leadership (93%), volunteer work (93%), essay (87%), pre-pharmacy grade point averages (80-86%), interview (85, 87%), and personal (76%) and professional (80%,82%) recommendations. These frequencies were calculated by adding the information sources that were given an importance score of 2 or more. This was based on the assumption that if the information source was given a 1, or no importance score, it was not used. In addition it should be noted that this data includes programs with and without pre-pharmacy requirements. This explains why the pre-pharmacy grade points were not used by 100% of the programs. Table 7 lists the number and percent of institutions using each of the information sources.

Table 7

Number of institutions utilizing each information source in the admission process

Information Source	Current (%)	Future (%)
Organizational leadership	51 (93)	51 (93)
Volunteer work	51 (93)	51 (93)
Essay	48 (87)	48 (87)
Interview	47 (85)	48 (87)
Pre-pharm cumulative GPA	46 (84)	47 (86)
Pre-pharm required GPA	45 (82)	47 (86)
Pre-pharm science GPA	44 (80)	46 (84)
Professional recommendations	44 (80)	45 (82)
Personal recommendations	42 (76)	42 (76)
Previous Degree	37 (67)	40 (73)
TOEFL	39 (71)	40 (73)
Verbal PCAT score	30 (55)	34 (62)
Biology PCAT score	29 (53)	33 (60)
Chemistry PCAT score	29 (53)	33 (60)
Quantitative Ability PCAT score	29 (53)	33 (60)
Reading Comprehension PCAT score	29 (53)	33 (60)
Composite PCAT score	29 (53)	32 (58)
TSE	16 (29)	18 (33)
High School GPA	15 (27)	15 (27)
Other Exams (ACT, SAT)	13 (24)	14 (25)
Other Extracurricular activities (work)	11 (20)	11 (20)

Analysis of Statistical Data

The four research questions are reviewed in this section. All factor findings are included on the charts but only the significant factors are reviewed.

Research question 1 used the calculation of a qualitative/ quantitative index score. The paired t-test statistical procedure was used to determine the presence or absence of a significant difference between the current and future admission practices. Individual t-tests were also completed on each individual information source, adjusting the alpha level to reflect the multiple t-tests compiled on the data. Possible subscales were tested through the use of factor analysis. Additional questions were asked on the survey regarding the procedures for grade point average, interview, essay, and recommendations. If differences appeared, Chi square analysis and paired t-test statistics were used to determine significance.

Research question 2 used the calculation of a total score for each program's current and future assessment of non-academic qualities by adding each weight together. Paired t-tests were then completed on the total score and each individual quality, adjusting the alpha level to accommodate the multiple t-test procedures. Research question 3 utilized the calculation of an index of each of the information sources and paired t-test procedure. Research question 4 utilized the chi-square statistical procedure to determine if differences exist between the current and anticipated future use of prediction studies.

Demographic information was provided to describe the respondents and to explore significant differences in the research questions.

Descriptive and Inferential Statistical Findings

Does the current use of qualitative and quantitative information sources by colleges of pharmacy in their admission practices differ from expected practices in the future?

There was not a significant difference in the overall qualitative and quantitative information sources. The mean 97 quantitative/qualitative index score was -11.67 with a standard deviation of 12.02 while the mean 2000 quantitative/qualitative index score was -13.13 with a standard deviation of 12.14.

The following table lists the descriptive and inferential statistics of the 1997 and 2000 qualitative/quantitative index scores as well as each individual information source scores. For the purposes of the individual information source data, the only "other" information sources included are the other exams and other extracurricular activities. For the 'other exam' information source, nine PharmD programs listed ACT/SAT as an important information source. Previous work experience was listed by six programs for the 'other extracurricular activities' information source. Table 8 displays the current and future statistics of the information scores.

Table 8

Statistics of 1997 and 2000 Qualitative and Quantitative Information Scores

Information source index score	Mean	SD	t-value	p-value
1997 Qual/ Quan Index Score	-11.67	12.02	1.488	.1425
2000 Qual/ Quan Index Score	-13.13	12.14		

Importance of information sources	1997 Mean	1997 SD	2000 Mean	2000 SD	t-value	p-value
Quantitative Sources						
High school GPA	1.691	1.275	1.691	1.275	*	*
Pre-pharm cum. GPA	3.909	1.506	4.036	1.387	-1.630	.1089
Pre-pharm science GPA	4.018	1.616	4.145	1.483	-1.547	.1278
Pre-pharm required GPA	3.945	1.557	4.073	1.451	-1.630	.1089
Verbal Ability PCAT	2.582	1.607	2.836	1.607	-1.784	.0800
Biology PCAT	2.400	1.523	2.636	1.544	-1.989	.0517
Reading Comprehension PCAT	2.636	1.544	2.618	1.661	-1.877	.0659
Quantitative Ability PCAT	2.582	1.607	2.873	1.634	-1.877	.0659
Chemistry PCAT	2.600	1.673	2.818	1.634	-1.692	.0964
Composite PCAT	2.691	1.804	2.873	1.816	-1.150	.2550
Other Exams (ACT, SAT)	1.636	1.310	1.673	1.320	-1.000	.3218
TOEFL	3.200	1.671	3.273	1.649	-1.272	.2088
TSE	1.764	1.347	1.891	1.423	-1.630	.1089
Qualitative Sources						
Interview	3.945	1.446	4.073	1.386	-1.847	.0703
Essay	3.618	1.326	3.709	1.370	-1.936	.0580
Personal recommendations	2.691	1.275	2.727	1.312	-.814	.4192
Professional recommendations	3.055	1.380	3.200	1.419	-1.737	.0882
Organizational leadership	3.436	1.135	3.491	1.120	-1.765	.0832
Volunteer work	3.364	1.095	3.455	1.068	-1.936	.0580
Previous Degree	2.236	1.122	2.491	1.230	-2.806**	.0070
Other Extracurricular activities (work)	1.655	1.635	1.509	1.103	.782	.4378

* Not enough data points to calculate t-value and p-value.

** $p < .05$

While the qualitative/quantitative index scores and most of the individual information sources did not demonstrate significant differences between current and future practices, the 'previous degree' information source was significantly different between 1997 and 2000. However, when the Bonferroni technique (Godfrey, 1992) was applied, the alpha level was adjusted to account for the multiple t-tests performed on the data. When this adjustment was made, this information source was not significant.

Factor analysis was completed on the variables to determine which information sources grouped together. The following table lists the results of the factor analysis. Factor 1, termed PCAT, included the PCAT subscores. Factor 2, qualities, included pre-pharmacy cumulative GPA, interview, essay, organizational leadership, volunteer work, and previous degree. Factor 3, foreign language tests included TOEFL, TSE, and a negative correlation to interview. Factor 4, pre-college factors, included high school GPA, other exams (ACT/SAT), and other extracurricular activities, and TSE had a significant negative correlation. Factor 5, Pre-pharmacy GPA, included pre-pharmacy cumulative, science, and required grade points. Factor 6, Recommendations, included essay, personal, and professional recommendations. Table 9 displays the factor loadings for each of the information sources. The factor analysis loadings were considered significant if the value was $\geq .30$ (Hair, Anderson, & Tatham, 1987). The correlation matrix used to determine the factor analysis is contained in Appendix F for the information source variables.

Table 9

Factor Loadings of 1997 Information Sources

Information Source	Factors					
	PCAT	Qualities	FL Tests	Pre-College	PP GPA	Rec.
High School GPA	-.085	.117	.006	.616	-.178	-.005
Pre-phar Cumulative GPA	-.003	.422	-.114	-.200	.438	.018
Pre-phar Science GPA	.049	.187	.043	-.068	.711	-.046
Pre-phar Req. Course GPA	.126	-.125	-.055	.002	.695	.127
PCAT Verbal	.869	-.048	.035	.017	.086	-.065
PCAT Biology	.887	.059	.038	-.026	-.029	-.018
PCAT Reasoning	.899	-.040	.045	.034	.079	-009
PCAT Quantitative	.897	-.033	.029	.051	.097	-.007
PCAT Chemistry	.908	.001	-.032	-.012	-.009	.019
PCAT Composite	.799	-.013	-.091	-.082	-.145	.008
TOEFL	.157	.198	.746	.177	-.104	-.058
TSE	.056	.137	.621	-.398	-.211	.200
Interview	.235	.320	-.702	-.178	-.257	.125
Essay	-.136	.374	.164	-.208	-.114	.330
Personal Recommendations	-.159	.263	-.071	.091	.040	.578
Professional Recommendations	.048	-.045	-.028	.096	.125	.811
Leadership	.001	.871	-.026	.157	.035	-.046
Volunteer Work	-.063	.865	-.010	.072	.031	-.030
Previous Degree	.010	.351	.232	-.315	.115	.144
Other Exams	.155	2.64 E-4	.106	.636	.024	-.187
Other Extracurricular Activities	.100	-.040	-.002	.726	-2.88 E-4	.301

The survey requested specific practices associated with the information sources of grade point average, interview, essay, and recommendations in

survey questions 2-6. The tables displaying the frequencies for each of the questions are contained in Appendix G. None of the questions had significant changes between what was currently done in 1997 and what is anticipated to occur in the year 2000.

Admission practices that were common for the fall 97 pharmacy admission procedures included the following:

- One third use a formula in the admission process.
- The most common minimum grade point average for application and admission is 2.5.
- One third make adjustments in grade point average based on the caliber of the institution.
- Approximately half ask the same questions to each interviewee.
- Thirty percent interview every applicant.
- Faculty are used by most programs on the interview team, followed by students and admissions personnel.
- Eighty percent ask interviewees situational questions; 95 percent ask achievement oriented questions.
- Over half allow the interviewers to have access to a portion or all of the applicant's file.
- Forty of 55 schools interview one applicant at a time and a most programs interview the applicants once.
- Eighty-five percent require an essay at the time of application; 60 percent require one at the time of the interview; and less than 10 percent require one at another point in time.
- Twenty-five percent publicize their essay questions.

- More than 80 percent use a standard reference form; over 90 percent do not use oral references; over 70 percent use letters of reference; and 33 percent require a list of references.

Is there a significant difference between the importance of non-academic qualities that pharmacy programs currently assess in applicants and those they expect to assess in the future?

Based on the survey responses each institution received a 'quality score' for 1997 and 2000. The quality score was calculated by summing the total number of quality importance values. These quality scores' means and standard deviations were then computed, and differences between the means were analyzed by the use of a paired t-test.

Table 10

Comparison of Current and Future Quality Scores

Quality Score	Mean	SD	t-value	p-value
Current - 1997	50.317	16.279	-1.637	.1097
Future - 2000	50.375	16.518		

The most important current and future qualities were motivation, character, ethics, oral communication skills, and written communication skills. A significant difference did not occur between the total quality score indicating that a significant change is not expected in the overall qualities assessed during the admission process. Additional t-tests with an adjusted alpha level were completed on each quality to determine if any individual

differences occurred. Significant differences did not occur in the importance of any of the qualities between the current practices and those anticipated in the future. Table 11 compares the means of the current and future importance scores of the qualities.

Table 11

Comparisons of Current and Future Individual Qualities

	1997		2000			
Quality Score	Mean	SD	Mean	SD	t-value	p-value
Character	4.255	1.339	4.275	1.313	-1.000	.3221
Ethics	4.216	1.346	4.235	1.320	-1.000	.3221
Service Orientation	3.588	1.374	3.588	1.374	----	-----
Work Habits	3.500	1.460	3.520	1.460	-1.000	.3222
Motivation	4.373	1.148	4.373	1.148	----	----
Leadership Skills	3.784	1.254	3.784	1.254	----	----
Empathy	3.686	1.378	3.706	1.375	-1.000	.3221
Responsible	3.824	1.381	3.843	1.377	-1.000	.3221
Problem-solving skills	3.920	1.455	3.920	1.455	----	----
Interpersonal relations	3.843	1.475	3.824	1.479	1.000	.3221
Written Communication Skills	4.096	1.272	4.096	1.272	----	---
Oral Communication Skills	4.135	1.469	4.192	1.442	-1.352	.1822
Maturity	3.667	1.492	3.686	1.503	-1.000	.3221
Other Skills	1.071	.463	1.073	.469	----	----

Will pharmacy schools' future use of information sources to assess non-academic qualities differ from current use by pharmacy programs?

Interview followed by references were the most frequently chosen information source to assess the non-academic qualities addressed in the above research question. Paired sample t-test analysis was performed on each of the information source scores. Based on the t-test analysis significant changes are not expected for the future. None of the programs indicated that any other information sources were used than the four provided on the survey. Table 12 lists each information source along with the mean and standard deviation.

Table 12

Information Source Changes Between Current and Future Admission Practices

	1997		2000			
	Mean	SD	Mean	SD	t-value	p-value
Interview	9.106	4.598	9.149	4.389	-.237	.8140
Essay	5.574	3.900	5.511	3.967	.829	.4112
Assessment Instrument	2.064	3.053	2.064	3.032	0.00	0.00
References	7.766	4.900	7.809	4.950	-.703	.4854

$p < .05$

Is there a significant difference between the current and future assessment/validation of admission processes by pharmacy schools?

A 3 x 2 chi-square analysis was performed investigating the effects of the future on admission validation/assessment practices. The endpoints that were requested on question 14 of the survey based on the literature review were first-year professional grade point average, clinical evaluations, licensure examination scores, completion of the program, and success as a practitioner. One school provided another endpoint measure, that being the third year therapeutics grades. Most of the changes in this analysis occurred with a shift from the "No" answer to "Unsure" with the only significant changes occurring in the clinical year evaluations and completion of program. Table 13 displays the frequencies and Chi square statistics for each of the questions.

Table 13

3 x 2 Contingency Tables for Admission Validation/Assessment Practices Ranked No, Unsure and Yes

First Year Professional GPA	Current	Future
No	10	4
Unsure	7	15
Yes	37	35
	$x^2 = 5.54$, p = .0628	
Clinical Experience Scores	Current	Future
No	21	9
Unsure	9	20
Yes	24	25
	$x^2 = 9.00$, p=.0111*	
Licensure Scores	Current	Future
No	18	10
Unsure	10	18
Yes	25	25
	$x^2 = 4.57$,p=.1017	
Completion of program	Current	Future
No	10	4
Unsure	3	12
Yes	41	37
	$x^2 = 8.168$, p=.0168*	
Success as a practitioner	Current	Future
No	20	11
Unsure	20	31
Yes	13	11
	$x^2 = 5.152$,p=.0761	

*p<.05

Demographic variable differences

Demographic variables collected on the survey included type of institution, program structure, last ACPE accreditation visit, and number of applicants, acceptances, and enrolled students. Specific research questions

were not written to address differences among these demographic variables since the literature review did not indicate the likelihood of that occurrence. However, this data was collected and used to describe the sample as well as to provide further explore the potential for significant differences among these variables. Each demographic variable was tested for significance on the four research questions. Thus, results were compiled on each demographic variable as it was tested against the current qualitative/quantitative index, the quality score, qualitative information sources, and assessment/validation measures. The results are summarized in the following sections with the significant results explained.

Public and Private Institutions

Public institutions were significantly more likely to use the pre-pharmacy science and pre-pharmacy required grade point average than private schools. Table 14 compares the means, and standard deviations of the public and private institutions along with the t-values and p-values from the t-test analysis.

Table 14

Comparison of Pre-pharmacy Science and Pre-pharmacy Required GPA for Public and Private Institutions

	Public		Private		t-value	p-value
	Mean	SD	Mean	SD		
Pre-pharmacy Science GPA	3.222	1.927	4.405	1.301	-2.691	.0095*
Pre-pharmacy Required GPA	3.222	1.801	4.297	1.309	-2.520	.0148*

*p<.05

Program Structure

The program structure (0-6, 0-4, 1-5, 2-4, 4-2) variable was split into the two categories of pre-pharmacy (1-5, 2-4, 4-2) and no pre-pharmacy (0-6, 0-4). These categories were tested with each of the research questions. Most of the significant differences in this exploration related to grade point averages and standardized exams. For example, programs without a pre-pharmacy program were significantly more likely to assess the high school grade point average and other exams (ACT/SAT), while those with a pre-pharmacy program were significantly more likely to assess the pre-pharmacy grade point averages. The only other significant finding was the relationship between the pre-pharmacy program and the qualitative/quantitative index. This could have also been influenced by the structure of the survey which listed six PCAT scores while the other information sources contained only three subscores or less. Thus, those institutions that used PCAT were more likely to use all of the subscores and therefore had a higher quantitative index score.

Table 15

Pre-pharmacy Program Structure and Qualitative/Quantitative Index Score

	No Pre-pharmacy		Pre-pharmacy		t-value	p-value
	Mean	SD	Mean	SD		
Qual/Quan Index Score	-2.857	5.872	-12.958	12.183	2.145	.0366

*p < .05

Last ACPE Accreditation Visit

The last ACPE accreditation categories were tested with each of the research questions. The analysis of variance statistical procedure was completed with the qualitative/quantitative index score, quality score, and information source scores. No significant differences occurred in any of these statistical procedures. A contingency table was attempted with the assessment/validation information. However, there were not enough values in all of the categories to complete the analysis.

Applicant/Acceptance/Enrolled Ratios

The various applicant/acceptance/enrolled ratios were tested with the research questions. Correlational analysis was used to determine if any significant correlations occurred with the qualitative/quantitative index score, the quality score, and the information source scores. No significant correlations occurred with any of these indexes or scores. Analysis of variance procedure was used to determine significance between assessment/validation responses and the admission ratios. No significant differences occurred in this exploratory analysis.

Chapter 5

SUMMARY, DISCUSSION, CONCLUSIONS, AND RECOMMENDATIONS

This chapter provides a summary of the study and discussion, conclusions, and recommendations from the data collected and analyzed in this study.

The focus of this study was to examine the current and future qualitative and quantitative pharmacy program admission practices. This included information regarding the assessment/validation of those practices.

Summary of Descriptive and Inferential Statistics

Chapter 4 presented the results of the analysis of data collected using the instrument developed to answer the research questions. The following table summarizes the findings of the research questions that guided this study.

Discussion of Findings

The profession of pharmacy is changing along with the health care industry. The pharmaceutical care model of practice has impacted curricular reform. Thus, the profession and educational institutions are calling for practitioners and students to possess different qualities and skills than in the past. As a result, pharmacy schools have a keen interest in admitting those students with the most potential and likelihood for success.

The following discussion of findings includes the current and future information sources used by pharmacy programs in their admission practices,

the qualities sought and information sources used to assess the qualities, the assessment/validation activities to predict success of the admitted students and therefore, of the admission process, and demographic differences. Table 16 summarizes each of the research questions and findings.

Information Sources Used

This study analyzed the information sources used in admission processes currently and compared them with future expectations of admission information sources. The information sources that were considered of above average importance (mean greater than 3.0) in this study were pre-pharmacy grade point averages (3.880-4.040), interview (3.920), essay (3.600), the TOEFL for students required to take it (3.180), organizational leadership (3.440), volunteer work (3.360), and professional recommendations (3.060).

Although previous degree was not of above average importance, it was the only information source expected to change significantly. There could be a correlation between this occurrence and the Chisholm et al. (1997) recent American Journal of Pharmaceutical Education report regarding the increased likelihood of success of pharmacy students who have previous degrees. Another explanation could be that as other health care professions become more like the medical profession, a four-year undergraduate degree will be required prior to entering a pharmacy program.

Table 16

Summary of Research Questions and Findings

Research Question	Findings
1. Does the current use of qualitative and quantitative information sources by colleges of pharmacy in their admission practices differ from expected practices in the future?	No difference in overall qualitative/quantitative index; the only significant difference in individual information sources was a higher importance for previous degree in the future.
2. Is there a significant difference between the importance of non-academic qualities that pharmacy schools currently assess in applicants and those they expect to assess in the future?	No significant difference in the total quality score or any of the individual qualities listed.
3. Will pharmacy schools' future use of information sources to assess non-academic qualities differ from current use by pharmacy programs?	No significant differences in any of the information sources
4. Is there a significant difference between the current and future assessment/validation of admission processes by pharmacy schools?	Significant difference in the change from 'no' to 'unsure' in completion of program

Mitchell (1987) and Mitchell et al., (1994) compiled the most important information sources for medical schools in 1986 and 1993. The literature does not provide evidence that a study of this nature has been completed for any of the other health care professions. Several similarities exist between admission practices in the medical and pharmacy professions as shown in the Table 17. These similarities exist between grade point averages, standardized exam scores, recommendations, and interviews.

The factor analysis demonstrated the information sources that are frequently used together. Most schools that utilized the PCAT scores used all of the subscores as well as the composite score. Since the PCAT subscores measure different aspects of the applicant, they may be helpful to the institution in the admission decision. Those institutions that used interview, essay, organizational leadership, volunteer work, and previous degree also tended to use the pre-pharmacy GPA. Pre-pharmacy GPA loaded on more than one factor, indicating that it may be used to assess more than one aspect of an applicant's profile. Institutions using the foreign language exams (TOEFL, TSE) were less likely to use interview. This provided evidence that programs use either the foreign language exams or the interview to assess qualities and skills. The programs that used the high school grade point, other entrance exams such as ACT and SAT, and extracurricular activities were less likely to use the TSE or previous degree. Most programs without a pre-pharmacy program apparently use the TOEFL rather than the TSE and very few of the applicants would have a previous degree since most of these admitted students are entering directly out of high school. The programs that used essay were also likely to use both types of recommendations, personal and professional.

Table 17

Comparison of Medical and Pharmacy School Important Information Sources

Information source	Medical Schools (1986)	Medical Schools (1993)	Pharmacy Schools (1997)
Grade point average	Undergraduate cumulative, science	Undergraduate cumulative	Pre-pharmacy cumulative, required, science
Standardized scores	MCAT	MCAT	PCAT
Recommendations	Letters of evaluation	Letters of evaluation	Professional recommendations
Interviews	Interview ratings	Interview ratings	Interview ratings
Essay	---	---	Essay scores
Extracurricular activities	Extracurricular activities	---	Organizational leadership skills
Work experience	Work in areas related to health care	---	Volunteer work
Other	Quality of prior institution Breadth/depth of course work State of legal residence	Knowledge of health care issues Commitment to health care	---

Hall and Bailey (1992) and Kawahara and Ethington (1994) described the use of formulas to adjust grade point averages based on the institution where

they were earned. The majority of pharmacy programs (67%) do not use this type of ranking system of previous grade point average. Those schools that adjusted grade point averages did so with the use of a formula or took into account where the pre-pharmacy program was completed. In addition, many schools (75%) utilize standardized tests like the PCAT and ACT/SAT which also provide a uniform measurement of cognitive abilities (Anderson, 1990).

Several recommendations are provided in the literature to improve the validity and reliability of the interview. Several authors suggest structuring methods that include asking standardized questions (Edwards et al., 1990), providing a panel of interviewers (Richards, et al., 1988), using situational and achievement questions (Latham & Saari, 1984), and not providing the applicant's file to the interviewers (Powis et al., 1988). More than half of the programs standardize their interview questions, provide a panel of interviewers, and use situational and achievement questions. Programs may want to consider not providing the applicant's file to the interviewers since currently over half of the admission practices allow interviewers access to some or all of the parts.

Current institutional admission practices appear to be in line with accreditation recommendations for the year 2000. The new accreditation standards (ACPE, 1997) require that pharmacy programs use other information sources besides academic information. The ACPE standards require that schools utilize admission practices that measure qualitative factors such as motivation, industry, and life-long learning. Most schools are utilizing qualitative information sources such as interview, essay, recommendations, organizational leadership, and volunteer work.

It should also be noted that while a significant difference did not occur in the total or individual information sources, some institutions are making

significant changes in their program's admission practices. For example, four programs plan to use the PCAT exam, two schools will use foreign language exams, three programs will consider a previous degree, and one program will use the interview. In addition, two programs will use the required and science pre-pharmacy grade point averages. While these changes are not large enough to impact the overall data used in this study, they are likely a large change for the individual programs.

Qualities Sought and the Information Sources Used

All of the listed qualities were considered of above average importance in the admission process other than those listed on the survey. The top five qualities were motivation to enter the profession (4.255-4.275), character (4.217), oral communication skills (4.135), ethics (4.174), and written communication skills (4.096). Very few respondents listed any other qualities searched for during the admission process. This indicates that those characteristics and skills recommended for assessment in multiple sources of the health professional literature are the same that are assessed during pharmacy admission processes. The following table reviews the quality, literature source documentation and average importance score from this study.

Table 18

Comparison of qualities in the literature with those assessed by programs

Quality	Literature source	Importance Mean
Motivation to enter the profession	ACPE, 1997; Baker et al., 1993; Blaisdell & Gordon, 1979; Duncan-Hewitt, 1996; Hall & Bailey, 1992; Meredith et al., 1982; Powis et al., 1988	4.255-4.275
Character & Integrity	McGaghie, 1990; Hall & Bailey, 1992	4.217
Ethics	Hansen & Pozehl, 1995; Meredith et al., 1982; Levine, et al., 1986	4.174
Oral and/or written communication skills	ACPE, 1997; Duncan-Hewitt, 1996; Hall & Bailey, 1992; Hansen & Pozehl, 1995; Levine et al., 1996	oral-4.135 written-4.096
Problem-solving skills	Duncan-Hewitt, 1996; Levine et al., 1986	3.920
Interpersonal relations	Hall & Bailey, 1992; McGaghie, 1990; Meredith et al., 1982	3.843
Responsible actions	Duncan-Hewitt, 1996; Levine et al., 1986	3.824
Leadership	Hall & Bailey, 1992; McGaghie, 1990	3.784
Supportive and encouraging behavior	Duncan-Hewitt, 1996; Powis et al., 1988	3.686
Maturity	Levine et al., 1986; Meredith et al., 1982	3.667
Service orientation	Duncan-Hewitt, 1996; McGaghie, 1990	3.588
Work habits	Levine et al., 1986; McGaghie, 1990	3.500

McGaghie (1990) stated that the interview is the best way to assess qualities. It appears from this study that pharmacy programs are following that recommendation. The interview was the most frequently used

information source to determine the presence of affective qualities. The next frequently used were references and essay. This study indicates that significant changes are not expected for the entering class of 2000.

Assessment/Validation Activities

The most frequent assessment points for admission practices appear to be the first year professional grade point average and completion of the program. Over 60 percent of the schools assessed their admission practices using these points during the curriculum. The other options listed in the curriculum may not be used as assessment/validation points for various reasons. Frequently, clinical experience scores are measured during the last year in the curriculum. Therefore programs may consider that too much time has passed between the point of admission and the completion of experiences. Licensure scores may not be used because the majority of programs report a high pass rate on the national exam. In addition, many boards of pharmacy do not release individual scores due to confidentiality issues. Success as a practitioner may not be compared to admission data because it is a difficult term to operationalize and therefore measure.

Mitchell (1984) assessed the use of prediction studies at medical schools to assess/validate admission practices. Forty-seven percent of the schools conducted their own studies. Comparably, this study determined that over 60 percent of the entry-level PharmD programs utilize assessment/validation studies. Unfortunately this type of information has not been sought from medical schools since the late 1980's so a true comparison is difficult.

Thus, a number of schools are assessing/validating their admission practices. The majority of schools are using the first year professional grade point, clinical year rotation scores, licensure scores, completion of program,

and success as a pharmacist. However, many are not currently undertaking local studies and are unsure of their assessment procedures in the future. This is particularly true in regard to completion of program. For this criterion variable, a significant number of programs who do not currently assess this aspect are unsure if they will be doing so in the future.

The literature provides recommendations for appropriate assessments of admission practices. The following are indicated regarding the use of information sources and their predictive qualities for student success:

- Grade point average (Hall & Bailey, 1992) and standardized tests (Friedman et al., 1987) predict first year grade point (Bandelos & Sedlacek, 1989; Hansen & Pozehl, 1995).
- Interview score predicts success in non-quantitative courses (Shahani, et al., 1991) and clinical year scores (Baker et al., 1993; Levine et al., 1986; Meredith et al., 1982; Walker et al., 1985; Ziedner et al., 1990).
- Grade point average and standardized exams predict Board scores (Meredith et al., 1982; Ziedner et al., 1990).
- Academic difficulty/withdrawal may be predicted by interview (Powis et al., 1988), subject interests (Blaisdell & Gordon, 1979), essay, cumulative grade point average, standardized exams (Schmalz et al., 1990).
- Success as a practitioner is recommended (ACPE, 1997) but very few studies have been published. It is difficult to define success as a practitioner. Cocolas et al. (1997) defines success as a practitioner as those pharmacists who are external PharmD applicants, have an office in a pharmacy-related organization, or are pharmacy program preceptors.

This study did not specifically ask the information sources that programs use to compare to these criterion variables during the education and post-

graduate achievements. Furthermore, few programs completed the explanation portion of this question on the survey.

Demographic Variable Differences and Meeting of Standards

Few differences were found between the various demographic variables of institution type, program structure, ACPE accreditation visit, or applicant/admit/enroll ratios. Public institutions tend to assess pre-pharmacy science and required grade point averages more than private institutions.

Most schools of pharmacy are meeting the adopted ACPE Guidelines 16.3 and 16.5 which focus on admission practices. Evidence of this was provided through this study. Most schools utilize qualitative information sources along with quantitative sources indicating that schools are in accordance with Guideline 16.3. Also, many schools compare admission practices with various assessment/validation points which is encouraged by Guideline 16.5. However, few of these studies have been published in the state and regional pharmacy journals. While diversity in admission practices is appropriate in American higher education (Carnegie Council, 1977), published studies are encouraged to provide potential methods for other programs to assess/validate their admission practices.

Conclusions

The following conclusions are drawn from this study of admission practices in admission programs:

- Current practices are not expected to change significantly in the future. However, qualitative information sources are utilized by colleges of pharmacy along with quantitative sources.

- Affective qualities and information sources documented in the health care profession literature are those sought and used in the admission process.
- While several schools assess their admission practices, many are not currently undertaking self-studies of their admission practices.
- Most pharmacy programs (82%) are meeting the adopted ACPE Guidelines 16.3 and 16.5 which focus on admission practices.

Implications and Recommendations

For Theory

This study supports much of the literature regarding admission practices in the health care profession. When comparing pharmacy program admission practices with other health care professional programs as documented in the literature, a number of similarities occurred. For example, the majority of programs in all of the health care professions appear to admit applicants based on multiple information sources. Furthermore, several similarities are present in those information sources. Duncan-Hewitt (1997) recommends the use of admission standards which will admit students who have the potential to provide pharmaceutical care. If programs are using qualitative information sources and assessing qualities to the degree of importance as indicated on this survey, this recommendation is being met.

For Research

Some respondents stated that they were not expecting admission practice changes between the current 1997 and future 2000 entering students admitted into the entry-level PharmD programs. However, some of them did

note that definite decisions on admission practices were not made until one year in advance of the admission process. Therefore the practices to be used for the entering class in fall 2000 may not be determined until a year from now. Therefore, it would be appropriate to repeat this study after students have been admitted for the academic year 2000 to see if any changes have indeed occurred and to determine the accuracy of this survey's responses.

Additional studies should focus on the methods used to assess/validate admission practices. It appears that several programs are willing to assess this based on the number of future "unsure" responses. This may indicate that programs are unsure on the appropriate point(s) to assess the admission process or how to complete the analysis.

Information is also needed on the results of schools' assessment/ validation of admission practices. The literature documents several recommendations with regard to the use of assessment/validation studies. However, few schools completed the explanation portion of the survey question on this topic. Thus, future studies should be completed with regard to how these local studies are conducted.

Other health professions contribute a great deal to the literature on prediction formulas. With the exception of a few published studies, literature is lacking with regard to this topic for pharmacy. This is also the case with regard to the correlation between admission practices and success as a practitioner. Since this is the endpoint for which schools are admitting students, it appears that this would be appropriate to measure.

Some of the suggestions from the literature review that were not covered in this study but may be important for pharmacy schools to research and consider in their admission processes include the importance of training interviewers and assessors of applications, essays, and other written exercises.

For Practice

The lack of significant changes in admission practices may not signal the need for concern since the majority of the institutions assess candidates quantitatively through measures such as grade point average and standardized exams as well as qualitatively through interviews, essays, assessments, recommendations, and evidence of organizational leadership and volunteer work. This in itself may have practical significance for the profession as it considers the way in which future practioners are admitted into the professional programs.

In addition, this study was designed for programs with entry-level PharmD programs who may have made the expected changes in admission practices simultaneously with admitting the first class of students into the new curriculum. This study's survey was not completed by those schools without entry-level PharmD programs who may not currently assess applicants using qualitative sources. It may be speculated that when an institution implements an entry-level PharmD program and embarks upon curricular reform, admissions procedure changes are also implemented.

The majority of program respondents felt that their institution was already meeting the accreditation standards on this topic. It appears that overall, programs are demonstrating the ACPE Guideline 16.3 as determined by the high number of programs utilizing interviews, essays, recommendations, previous degree, organizational leadership, and volunteer work. Guideline 16.5 encourages the use of studies that relate admissions criteria with student success in the program. This standard appears to be met by a majority of the programs. Evidence of this is shown by the number of

schools that compile data on their admitted students to predict success at various points throughout the curriculum. Therefore, it appears that the adoption of these standards was appropriate due to pharmacy's response in implementing those standards. However, the possibility exists that the standards are not being completed at the level that the accrediting agency chooses them to be. Thus, each program will need to be assessed on an individual basis through accreditation self-study and visit processes.

During the accreditation self-study process the following guidance questions/information requests might be listed in the guide for the two standards regarding admission practices. These questions are based on the review of literature and the results of this survey.

Guideline 16.3 Self-Study Questions

Describe the admissions process, policies, and procedures. Include criteria for admission and weighting of the various factors used. If an interview procedure exists describe the procedure. What are the qualities that are assessed besides the academic factors? What information sources are used to determine the presence of these qualities?

Provide qualitative and quantitative information concerning the qualifications of students admitted to the program. How do students enrolled in the program compare with students in other health professional programs of the university and/or other students at the university generally, using this data?

Guideline 16.5 Self-Study Questions

What are the results of any assessment/validations studies where admission scores are correlated with student success in the curriculum/profession? What endpoints of comparison are used in the

assessment/validation studies (for example, first professional year grade point average, clinical rotations scores, etc.)?

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APPENDIX A

CHARACTERISTICS RECOMMENDED TO BE ASSESSED UPON ADMISSION

	McGaghie (1990)	Powis et al. (1988)	Meredith et al. (1982)	Hall & Bailey (1992)	Levine et al. (1986)	Hansen & Pozehl (1995)	Baker et al. (1993)	Duncan-Hewitt (1996)	ACPE (1997)
Motivation to enter profession		x	x	x			x	x	x
Oral Communication Skills				x	x	x		x	x
Written Communication Skills				x	x	x		x	x
Interpersonal relations	x		x	x					
Leadership	x			x					
Maturity			x		x				
Service Orientation	x							x	
Work Habits	x				x				
Altruism	x								
Supportive/ Encouraging Behavior/Empathy		x						x	
Responsible					x			x	
Problem-solving					x			x	

	McGaghie (1990)	Powis et al. (1988)	Meredith et al. (1982)	Hall & Bailey (1992)	Levine, et al. (1986)	Hansen & Pozehl (1995)	Baker et al. (1993)	Duncan-Hewitt (1996)	ACPE (1997)
Compassion				x					
Interest in others				x					
Professionalism					x				
Critical Thinking								x	
Perseverance		x							
Decision-Making								x	
Self-Learner								x	
Adaptability	x								
Tolerance of ambiguity		x							
Time management					x				
Flexibility					x				
Open-mindedness					x				
Ability to summarize/ paraphrase					x				
Creativity						x			
Social competence	x								
Personality/Attitude	x								
Reaction to peers, authority figures					x				
Explanatory/ reasoning abilities						x			
Self-confidence		x							
Ability to handle stressful situations				x					

	McGaghie (1990)	Powis et al. (1988)	Meredith et al. (1982)	Hall & Bailey (1992)	Levine et al. (1986)	Hansen & Pozehl (1995)	Baker et al. (1993)	Duncan-Hewitt (1996)	ACPE (1997)
Breadth of knowledge	x								
Individual achievement			x						
Knowledge of profession					x				
Personal strengths/ weaknesses					x				
Synthesis/Expertise						x			
Industry									x
Personal Appearance							x		
Judged ability			x		x				

APPENDIX B

PREDICTABILITY STUDIES

Table 1

Studies that relate admission criteria with professional grade point average

Author(s)/ Year	Subject Pool	Variables Tested	Significant Influencing Variables / Results
Hall and Bailey (1992)	Medical Students	Undergrad GPA, Sci GPA, College selectivity	-70% of variance of 1st year GPA explained by undergrad GPA -MCAT, consideration of academic caliber of undergrad institution leveled the field
DeVaul et al. (1987)	Medical Students	Academic variables: GPA, MCAT Demographic: age, gender, ethnicity, resident Preferential: pre-prof education, interviewer and committee ratings	-No difference between initially-rejected and initially-admitted students although admission decision was due to interview score

Bandalos and Sedlacek (1989)	Pharmacy Students	Prepharm GPA, Prepharm required GPA, prepharm chem/math GPA, PCAT scores, source (computed variable of prepharm institutions)	-Prepharm required GPA, PCAT biology, and verbal aptitude scores, source -PCAT reading had neg correlation
Friedman et al. (1987)	Pharmacy Students	Pre-phar GPA, gender, race, age	-Pre-phar GPA and PCAT together most predicted professional GPA
Wu-Pong et al. (1996)	Pharmacy Students	Language status, SAT, PCAT, GPA total	-Language status was not a significant predictor of GPA
Levine et al. (1986)	56 Physical Therapy Students	Interview type/score; preadm. sci GPA, cum GPA Interviews: knowledge of prof, time mgmt, responsibility, personal strengths/weaknesses, integrity, problem-solving, communication	Science GPA and Cum GPA had moderate influences on cumulative professional GPA

Graham (1991)	203 MBA Students	MAT, GMAT, Undergrad GPA, BA/BS degree, Sem in prog, Ethnicity, Gender, Yrs. since undergrad, Married, Age	GMAT group - GMAT only MAT group - Ethnicity, Undergrad GPA, MAT
Hansen and Pozehl (1995)	Masters Degree in Nursing	Age, Yrs of Nursing Experience, Months to complete program, undergrad nursing/non-nursing GPA, GRE scores	Undergrad GPA and aggregate GRE score significantly affected graduate GPA
Graham and Terracina (1988)	98 Physical Therapy Graduates	Age, HS GPA, total college, total sci. credit completed, sci GPA, pre-prof. cum GPA, SAT, interview score	1. HS GPA 2. Age at entry 3. Preprof. cum GPA 4. GPA 5. Preprof. GPA 6. SAT 7. # yrs. in college

Shahani et al. (1991)	331 under-graduate students	Interview evaluations, HS rank, SAT scores	-SAT scores -validity of the interview in predicting grades was found, but not incremental validity
Smith et al. (1986)	123 Medical Students	Interview	No difference between interview and non-interview group
Walker et al. (1985)	96 dental students	Interview	Lack of significant correlation between interview and academic performance in pre-clinical curriculum.
Ziedner et al. (1990)	321 Nursing Students	Scholastic Aptitude battery, Matriculation scores, group interview	Scholastic Aptitude Test

Table 2

Studies that relate admission criteria with clinical course work

Author(s)/ Year	Subject Pool	Variables tested	Significant Influencing Variables/ Results
Baker et al. (1993)	200 Anesthesiology Residents	Undergrad GPA, MCAT, Board scores, Med school GPA and class rank	-Traditional academic criteria are not sufficiently predictive of clinical performance or interpersonal skills
DeVaul et al. (1987)	200 Medical Students (150 initially admitted; 50 initially rejected)	Academic: GPA, MCAT Demographic: age, gender, ethnicity, resident Preferential: preprof. evaluation, interviewer rating, committee rating	-No difference between initially-rejected and initially-admitted students although admission decision was due to interview score
Wu-Pong et al. (1996)	Pharmacy Students	Language status, SAT, PCAT, GPA total	-Language status was not a significant predictor of honors received at graduation

Levine et al. (1986)	56 Physical Therapy Students	Interview type/score; preadm. sci GPA, cum GPA Interviews: knowledge of prof, time mgmt, responsibility, personal strengths/weaknesses, integrity, problem-solving, communication	Verbal communication score from interview correlated with clinical grades
Inglehart and Brown (1990)	1156 Medical Students	Professional Identity factors	-Importance of career to one's parents (negative), self-related factors for selecting medical school, focus on becoming MD
Hansen and Pozehl (1995)	Masters Degree in Nursing	Age, Yrs of Nursing Experience, Months to complete program, undergrad nursing/non-nursing GPA, GRE scores	-Age was only significant variable with total GPRS (graduate performance rating scale-measure of clinical performance at graduation)
Hall et al. (1992)	62 Medical Students	Admission interview scores	-Stronger interview scores relate to better dean's letter ratings
Meredith et al. (1982)	85 Medical Students	MCAT Interview	-Admission interview -MCAT Sci-Quant

Walker et al. (1985)	96 dental students	Interview	Interview gains in correlation value in the clinical phase of the curriculum
Ziedner et al. (1990)	321 Nursing Students	Scholastic Aptitude battery, Matriculation scores, group interview	Interview

Table 3

Studies that relate admission criteria with Licensure exam score

Author(s)/ Year	Subject pool	Variables tested	Significant Influencing Variables/ Results
DeVaul et al. (1987)	200 Medical Students (150 initially admitted; 50 initially rejected)	Academic: GPA, MCAT Demographic: age, gender, ethnicity, resident Preferential: preprof. evaluation, interviewer rating, committee rating	-No difference between initially-rejected and initially-admitted students although admission decision was due to interview score
Inglehart and Brown (1990)	1156 Medical Students	Professional Identity factors	-Importance of career to one's parents (negative), self-related factors for selecting medical school, focus on becoming MD

Meredith et al. (1982)	85 Medical Students	MCAT Interview	-MCAT Sci-Quant -GPA
Ziedner et al. (1990)	321 Nursing Students	Scholastic Aptitude battery, Matriculation scores, group interview	-Aptitude test scores

Table 4

Studies that relate admission criteria with successful completion of program.

Author(s)/ Year	Subject Pool	Variables Tested	Significant Influencing Variables/ Results
Blaisdell and Gordon (1979)	Occupational Therapy Students	SAT;HS rank; type of HS; subject interest rating (SIV); HS specific course grades; # hrs homework/work; #yrs of decision; age; # children; family rank; #health prof in family; leadership positions; activities; gender; % of grads going to 4 yr inst.	1) subject interest in life sciences 2) SIV support score 3) anthropology course 4) % of HS grads going to 4 yr (neg.) 5) math/soc. sci subject interest score 6) SIV conformity score

Powis et al (1988)	Medical Students	GPA, interview score	-Academic score the same b/w failures and succeeders -Non-cognitive scores differed
Schmalz et al (1990)	Occupational Therapy Students	Sex, age, marital status, ethnic origin, entering cum. GPA, institutions attended, essay scores, Otis Quick-Scoring Mental Ability Tests	-Essay, cum GPA, institution, OTIS were predictive of success
Schmalz et al (1990)	Physician Assistant Students	Sex, age, marital status, ethnic origin, entering cum. GPA, institutions attended, admission interviews, Otis, Stanford Diagnostic Reading Test	-OTIS was predictive

APPENDIX C

SURVEY COVER LETTER

December 10, 1997

Dear

You are invited to participate in a study of admission practices in entry-level PharmD programs. The purpose of this survey is to describe admission practices at colleges of pharmacy and to assess anticipated changes within those practices with the implementation of the new accreditation standards for the Fall 2000 entering class. This study is jointly sponsored by Drake University, the American Council of Pharmaceutical Education (ACPE), and the American Association of Colleges of Pharmacy.

As the individual identified as chair of the admission committee, the following survey is enclosed for completion regarding the admission practices at your institution. Please note that the surveys are coded for follow-up purposes; the sponsoring institutions will receive summary data rather than any individual school information.

As my sample size is relatively small, your response is vitally important to my study. I appreciate you taking the time to respond to these questions. Please complete the enclosed survey and return to me by December 20, 1997.

If you have any questions, please contact me (515-271-2172 or renae.chesnut @drake.edu). Thank you for your time and the courtesy of your assistance.

Sincerely,

Renae Chesnut
Doctoral Candidate and
Director of Student Services
College of Pharmacy and Health Sciences

APPENDIX D

ENTRY-LEVEL PHARM D ADMISSION SURVEY

Survey of Entry-level PharmD Admission Practices

1. What is the structure of your entry-level PharmD program for the 1997-98 academic year?

___ 0-6 ___ 1-5 ___ 2-4 ___ 4-2 ___Other (please explain)_____

___Did not admit students into an entry-level PharmD professional program

(Note: If you did not admit students into an entry-level PharmD program for the 1997-98 academic year, please return this unanswered survey in the enclosed pre-paid envelope.)

2. How important are the following information sources to your institution in the entry-level PharmD professional program admission process? Please circle the corresponding number for the Fall 1997 and Fall 2000 entering classes using the following scale:

1	2	3	4	5
No Importance	Below Average Importance Factor	Average Importance Factor	Above Average Importance Factor	High Importance Factor

	Information Source	Importance in Admission Decision (Fall 1997)					Importance in Admission Decision (Fall 2000)				
Grade point average	High School	1	2	3	4	5	1	2	3	4	5
	Pre-pharmacy cumulative	1	2	3	4	5	1	2	3	4	5
	Pre-pharmacy science	1	2	3	4	5	1	2	3	4	5
	Pre-pharmacy required course work	1	2	3	4	5	1	2	3	4	5
	Other	1	2	3	4	5	1	2	3	4	5
PCAT score or percentile	Verbal Ability	1	2	3	4	5	1	2	3	4	5
	Biology	1	2	3	4	5	1	2	3	4	5
	Reading Comprehension	1	2	3	4	5	1	2	3	4	5
	Quantitative Ability	1	2	3	4	5	1	2	3	4	5
	Chemistry	1	2	3	4	5	1	2	3	4	5
	Composite	1	2	3	4	5	1	2	3	4	5
Foreign language tests for non-English speaking	TOEFL (Test of English Foreign Language)	1	2	3	4	5	1	2	3	4	5
	TSE (Test of Spoken English)	1	2	3	4	5	1	2	3	4	5
	Other	1	2	3	4	5	1	2	3	4	5
Other Standardized Exams		1	2	3	4	5	1	2	3	4	5
		1	2	3	4	5	1	2	3	4	5
Interview		1	2	3	4	5	1	2	3	4	5
Essay		1	2	3	4	5	1	2	3	4	5
Recommendations	Personal	1	2	3	4	5	1	2	3	4	5
	Professional	1	2	3	4	5	1	2	3	4	5
Assessment Instruments	(Please list)	1	2	3	4	5	1	2	3	4	5
		1	2	3	4	5	1	2	3	4	5
Extra-curricular activities	Organizational leadership	1	2	3	4	5	1	2	3	4	5
	Volunteer work	1	2	3	4	5	1	2	3	4	5
	Other (please list)	1	2	3	4	5	1	2	3	4	5
Previous Degree		1	2	3	4	5	1	2	3	4	5
Other sources		1	2	3	4	5	1	2	3	4	5
(Please list)		1	2	3	4	5	1	2	3	4	5

3. Please circle the appropriate response and complete the additional information if requested:

	Fall 1997	Fall 2000
Does your institution utilize a formula or mathematical formula in the admission decision?	Yes No If yes, Formula	Yes No If yes, Formula
Is there a minimum GPA for review of application?	Yes No If yes, Min. GPA_____	Yes No If yes, Min. GPA_____
Is there a minimum GPA for admission?	Yes No If yes, Min. GPA_____	Yes No If yes, Min. GPA_____
Are adjustments made in the GPA depending on the type or academic caliber of the previous institution?	Yes No If yes, Explain	Yes No If yes, Explain

4. If your institution requires an interview in the entry-level PharmD professional program admission process, please answer the following questions by circling the correct response:

	Fall 1997	Fall 2000
Are the same questions asked of every applicant?	Yes No	Yes No
Is every applicant interviewed?	Yes No	Yes No
Who interviews the applicants?	Check all that apply: ___ Admission Personnel ___ Administration ___ Faculty ___ Students ___ Alumni ___ Practitioners	Check all that apply: ___ Admission Personnel ___ Administration ___ Faculty ___ Students ___ Alumni ___ Practitioners
How many applicants are interviewed at one time?	1 2 3	1 2 3
Are questions asked of the interviewee that refer to his/her reaction to a given situation?	Yes No	Yes No
Are questions asked of the interviewee that relate to past achievements/challenges/etc.?	Yes No	Yes No
How many interviews are conducted of each applicant?	1 2 3	1 2 3
Do interviewers have access to student files?	Yes No Some do (Please explain): _____	Yes No Some do (Please explain): _____

5. If your institution requires an essay in the entry-level PharmD professional program process, please answer the following question:

	Fall 1997	Fall 2000
Are candidates required to complete an essay along with their application?	Yes No	Yes No
Are candidates required to complete an essay at the time of the interview?	Yes No	Yes No
Are the essay questions or topics publicized to applicants prior to the point of the application?	Yes No	Yes No

6. If your institution requires references in the entry-level PharmD professional program admission process, please answer the following questions:

	Fall 1997		Fall 2000	
Is a standard form utilized?	Yes	No	Yes	No
Are oral references accepted?	Yes	No	Yes	No
Do applicants list references only?	Yes	No	Yes	No
Are letters of reference required?	Yes	No	Yes	No

7. Please circle the weight that each characteristic has in the admission decision process and the source(s) your institution uses to evaluate that characteristic. If another source (Other) is used, please explain in the area below this chart.

Characteristic Measured	Current (Fall 1997) Weight of Importance (1 = none 5 = high)	Current (Fall 1997) Source (Interview, Essay, Assessment, References, Other)	Anticipated (Fall 2000) Weight of Importance (1 = none, 5 = high)	Anticipated (Fall 2000) Source (Interview, Essay, Assessment, References, Other)
Character & Integrity	1 2 3 4 5	I E A R O	1 2 3 4 5	I E A R O
Ethics	1 2 3 4 5	I E A R O	1 2 3 4 5	I E A R O
Service Orientation	1 2 3 4 5	I E A R O	1 2 3 4 5	I E A R O
Work Habits	1 2 3 4 5	I E A R O	1 2 3 4 5	I E A R O
Motivated to enter profession	1 2 3 4 5	I E A R O	1 2 3 4 5	I E A R O
Leadership	1 2 3 4 5	I E A R O	1 2 3 4 5	I E A R O
Supportive/ Encouraging Behavior/Empathy	1 2 3 4 5	I E A R O	1 2 3 4 5	I E A R O
Responsible	1 2 3 4 5	I E A R O	1 2 3 4 5	I E A R O
Problem-solving	1 2 3 4 5	I E A R O	1 2 3 4 5	I E A R O
Interpersonal relations	1 2 3 4 5	I E A R O	1 2 3 4 5	I E A R O
Written Communication Skills	1 2 3 4 5	I E A R O	1 2 3 4 5	I E A R O
Oral Communication Skills	1 2 3 4 5	I E A R O	1 2 3 4 5	I E A R O
Maturity	1 2 3 4 5	I E A R O	1 2 3 4 5	I E A R O
Other _____	1 2 3 4 5	I E A R O	1 2 3 4 5	I E A R O
Other _____	1 2 3 4 5	I E A R O	1 2 3 4 5	I E A R O
Other _____	1 2 3 4 5	I E A R O	1 2 3 4 5	I E A R O
Other _____	1 2 3 4 5	I E A R O	1 2 3 4 5	I E A R O
Other _____	1 2 3 4 5	I E A R O	1 2 3 4 5	I E A R O
Other _____	1 2 3 4 5	I E A R O	1 2 3 4 5	I E A R O

Please explain any other information sources used to gain information from candidates regarding these characteristics _____

8. Will your institution compile data for the entry-level PharmD class that entered Fall 1997 or will be entering in Fall 2000 using admission information sources to predict success at any of the following points?

Prediction Point	Current (Fall 1997)			Anticipated (Fall 2000)		
First year professional grade point	Yes	No	Unsure	Yes	No	Unsure
Clinical year evaluations	Yes	No	Unsure	Yes	No	Unsure
Board exam scores	Yes	No	Unsure	Yes	No	Unsure
Successful completion of the program	Yes	No	Unsure	Yes	No	Unsure
Success as a practitioner	Yes	No	Unsure	Yes	No	Unsure
Other	Yes	No	Unsure	Yes	No	Unsure

Please describe any of the above measures:

---

9. Is your institution public or private? ___ Public ___ Private

10. How many students applied to your program for Fall 1997?_____

11. How many students were accepted into your program for Fall 1997?_____

12. How many students enrolled in your program for Fall 1997? _____

13. What was the date of your last ACPE evaluation visit?_____

14. Do you believe that your college is already following ACPE's newly approved entry-level PharmD admission standards (16.3, 16.5) which will be implemented for students entering in the 2000-01 academic year? (Please check appropriate response) ___ Yes _____No _____Unsure of standards

15. Please add any additional comments regarding your admission procedures in the space provided below:

Please return in the enclosed pre-paid envelope to Drake University or fax to Renae Chesnut at 515-271-4171. Thank you once again for your time and cooperation!

APPENDIX E

SURVEY FOLLOW-UP LETTER

January 21, 1998

Dear

Approximately a month ago you should have received a survey regarding current admission practices and anticipated changes for entry-level PharmD programs. To date, I have not received your completed survey. If your survey has already been mailed, thank you for your participation.

If you have not yet had the opportunity to complete the survey, please consider taking a few moments to complete it. Because of the limited number programs, your response is very important to this study. For your convenience I have enclosed another survey and self-addressed, postage-paid envelope. If you are not the person who should have received this survey, please feel free to forward it to the appropriate individual or contact me.

Thank you for your cooperation. I would really appreciate your effort in getting the survey back to me in the next few days. If you have any questions, please contact me (515-271-2172 or renae.chesnut @drake.edu). Thank you for your time and the courtesy of your assistance.

Sincerely,

Renae Chesnut
Doctoral Candidate and
Director of Student Services
College of Pharmacy and Health Sciences

APPENDIX F

INFORMATION SOURCE CORRELATION TABLE

Table 1

Correlations among the information sources

Partial Correlation Matrix

	HS 97	PP Cum 97	PP Sci 97	PP Req 97	PCAT Ver 97	PCAT Bio 97	PCAT Rea 97	PCAT Qua 97	PCAT Chem 97	PCATCom97	TOEFL97	TSE97	INT97	ESS97	RECPER97	RECPRO97	LEA97	VOL97	PREV DEG97	OTH EX 97	EXT OTH97
HS 97	1.000	-.148	-.213	.105	-.032	.017	-.001	-.054	.039	.105	.049	-.080	-.162	-.184	.274	-.114	.097	-.024	.020	.247	.155
PP Cum 97	-.148	1.000	.357	.048	.117	-.149	-.061	.037	.123	-.186	-.224	.029	.022	.234	-.112	.145	.021	.115	-1.151E-4	.003	-.133
PP Sci 97	-.213	.357	1.000	.285	-.132	-.080	.126	.036	.016	-.096	.063	-.118	-.093	-.175	.249	-.178	-.044	.054	.236	.025	.012
PP Req 97	.105	.048	.285	1.000	.099	-.116	.063	.108	-.203	.004	-.140	-.092	-.061	-.110	-.055	.238	-.054	.063	.082	-.202	-.063
PCAT Ver 97	-.032	.117	-.132	.099	1.000	-.015	.328	.332	-.096	.157	.150	-.226	-.048	.168	.166	-.315	.338	-.378	.032	-.065	-.210
PCAT Bio 97	.017	-.149	-.080	-.116	-.015	1.000	-.056	.279	.475	-.131	.068	.008	-.024	-.158	.206	-.140	-.135	.175	.243	-.031	-.192
PCAT Rea 97	-.001	-.061	.126	.063	.328	-.056	1.000	.586	.295	.065	.076	.196	.070	.008	.041	-.072	-.123	.081	-.015	.086	.089
PCAT Qua 97	-.054	.037	.036	.108	.332	.279	.586	1.000	.115	-.069	-.103	.033	-.081	-.112	-.090	.164	-.063	.097	-.110	.083	.160
PCAT Chem 97	.039	.123	.016	-.203	-.096	.475	.295	.115	1.000	.319	.043	-.180	.164	.074	-.213	.264	.218	-.228	-.033	-.181	-.045
PCATCom97	.105	-.186	-.096	.004	.157	-.131	.065	-.069	.319	1.000	-.299	.157	-.026	.014	-.215	.056	-.355	.406	.015	-.108	.079
TOEFL97	.049	-.224	.063	-.140	.150	.068	.076	-.103	.043	-.299	1.000	.328	-.332	.263	-.154	.066	-.057	.147	-.071	.201	.055
TSE97	-.080	.029	-.118	-.092	-.226	.008	.196	.033	-.180	.157	.328	1.000	-.124	-.005	.190	-.053	.198	-.181	.277	-.226	-.161
INT97	-.162	.022	-.093	-.061	-.048	-.024	.070	-.081	.164	-.026	-.332	-.124	1.000	.067	.221	-.092	.085	-.029	.036	-.009	-.034
ESS97	-.184	.234	-.175	-.110	.168	-.158	.008	-.112	.074	.014	.263	-.005	.067	1.000	.207	.078	-.347	.374	.217	-.054	.168
RECPER97	.274	-.112	.249	-.055	.166	.206	.041	-.090	-.213	-.215	-.154	.190	.221	.207	1.000	.530	-.006	.084	-.184	-.102	.008
RECPRO97	-.114	.145	-.178	.238	-.315	-.140	-.072	.164	.264	.056	.066	-.053	-.092	.078	.530	1.000	.032	-.070	.152	.017	.155
LEA97	.097	.021	-.044	-.054	.338	-.135	-.123	-.063	.218	-.355	-.057	.198	.085	-.347	-.006	.032	1.000	.945	.045	-.029	.313
VOL97	-.024	.115	.054	.063	-.378	.175	.081	.097	-.228	.406	.147	-.181	-.029	.374	.084	-.070	.945	1.000	.011	.018	-.278
PREV DEG97	.020	-1.151E-4	.236	.082	.032	.243	-.015	-.110	-.033	.015	-.071	.277	.036	.217	-.184	.152	.045	.011	1.000	-.029	3.661E-4
OTH EX 97	.247	.003	.025	-.202	-.065	-.031	.086	.083	-.181	-.108	.201	-.226	-.009	-.054	-.102	.017	-.029	.018	-.029	1.000	.193
EXT OTH97	.155	-.133	.012	-.063	-.210	-.192	.089	.160	-.045	.079	.055	-.161	-.034	.168	.008	.155	.313	-.278	3.661E-4	.193	1.000

55 observations were used in this computation.

APPENDIX G

FREQUENCY DISTRIBUTIONS OF QUESTIONS REGARDING GPA, INTERVIEW, ESSAY AND RECOMMENDATIONS

Table 1

Frequency of Responses to Questions Regarding GPA, Interview, Essay and Recommendations

Information Question	Current		Future	
	Yes (%)	No (%)	Yes (%)	No (%)
Does your institution use a formula in the admission decision?	18 (33)	37 (67)	19 (35)	36 (65)
Are adjustments made in the GPA depending on academic caliber of the previous institution?	18 (33)	36 (67)	18 (33)	36 (67)
Are the same questions asked of every applicant?	24 (55)	20 (45)	25 (57)	19 (43)
Is every applicant interviewed?	12 (28)	31 (72)	13 (30)	30 (70)
Are questions asked refer to the interviewee's reaction to a given situation?	36 (80)	9 (20)	38 (84)	7 (16)
Are questions asked that relate to past achievements/challenges, etc.	41 (95)	2 (5)	41(95)	2 (5)

Do interviewers have access to some part of the student's file?	26 (58)	19 (42)	26 (58)	19 (42)
Is an essay required at the time of application?	44 (85)	8 (15)	43 (84)	9 (16)
Is an essay required at the time of the interview?	29 (58)	21 (42)	31 (62)	19 (38)
Are candidates required to complete an essay at another point?	4 (8)	44 (92)	4 (8)	44 (92)
Are the essay questions publicized?	13 (25)	38 (75)	13 (25)	38 (75)
Is a standard form used for references?	37 (82)	8 (18)	37 (82)	8 (18)
Are oral references accepted?	3 (7)	42 (93)	3 (7)	42 (93)
Are letters of reference required?	33 (73)	12 (27)	34 (76)	11 (24)
Is a list of references required?	15 (33)	30 (67)	15 (67)	30 (67)

Interview questions with numeric responses	Current			Future		
	1	2	≥ 3	1	2	≥ 3
How many applicants are interviewed at one time?	40	0	3	40	0	3
How many interviews are conducted of each applicant?	32	9	4	32	9	4

Table 2

Number of Programs With a Minimum GPA to Apply and Be Admitted

Question and Possible Response	Current	Future
Is there a minimum GPA to apply?		
No	9	9
Yes - 2.0-2.4	6	5
Yes - 2.5-2.9	27	28
Yes - 3.0-3.4	10	9
Yes - GPA not given	3	2
Is there a minimum GPA to be admitted?		
No	16	16
Yes - 2.0-2.4	9	9
Yes - 2.5-2.9	21	20
Yes - 3.0	6	6
Yes - GPA not given	4	4

Table 3

The Types of Individuals Used in Interviews

Interview Team Members	Current	Future
Admissions	16	17
Admissions Committee	1	1
Administration	14	13
Faculty	41	41
Students	20	22
Alumni	12	12
Practitioners	14	14